State of Montana
Department of Environmental Quality

Draft Environmental Impact Statement for the Holcim (US) Inc., Tire Burning Proposal

July 2006

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CONTENTS

EXECUTIVE SUMMARY

Introduction

Holcim (US) Inc. (Holcim) has proposed to burn whole tires as fuel in its portland cement kiln at Trident, MT, and has applied for a modification to its air quality permit to allow tire burning and for a solid waste license to store tires on its property. The Trident plant is in Gallatin County near the Missouri Headwaters, approximately five miles northeast of Three Forks, MT (Figure ES-1).

The Department of Environmental Quality (DEQ) prepared a draft environmental impact statement (DEIS) to explain the proposal, the possible consequences of the proposal, and the information and decisions involved in addressing the permits Holcim needs to use tires as fuel.

The executive summary provides an overview of the DEIS. Some aspects of the DEIS, such as the discussions of property values and the human health and ecological risk assessments, are involved. Members of the public expressed an interest in these issues, so DEQ took special care to explain them. A list of acronyms has been included to assist readers, along with the names of DEQ persons who helped prepare the DEIS.

Holcim's current air quality permit authorizes combustion of up to 100 percent natural gas, 100 percent coal, 100 percent petroleum coke, or any combination of these fuels. Holcim's primary objective for seeking a modification of its existing air quality permit is to realize reductions in fuel and operating costs. The mid-kiln combustion of tires would supplement up to 15 percent of the required fuel for Holcim's kiln.

Holcim submitted an application to modify its air quality permit on October 3, 2001. Between October 2001 and March 2003, DEQ conducted reviews and requested supplemental information and clarifications from Holcim. On March 24, 2003, DEQ issued a Preliminary Determination for the modification to the air quality permit and an Environmental Assessment (EA) pursuant to the Montana Environmental Policy Act (MEPA). A public hearing was held in Manhattan, MT, on April 29, 2003. Numerous comments were received during the public comment period (March 24 through May 30, 2003). DEQ considered these comments and issued a revised EA on August 15, 2003. This EIS was prepared to comply with DEQ's determination that an EIS was required and with MEPA.

An application to incinerate tires requires DEQ to determine whether the projected emissions and ambient concentrations from the proposed fuel would constitute no more than a negligible risk to the public health, safety, and welfare, and to the environment. If DEQ determines that Holcim's applications meet the requirements of the Montana's laws and regulations, the solid waste license will be issued and the air quality permit will be modified. Conditions may be applied to reduce or eliminate environmental impacts.

Interested persons should keep in mind that until Holcim can do a "test burn," the DEQ is relying on technical information, engineering specifications, and information from other cement plants that are currently burning tires to project what the emissions will be. This information has proven to be reliable in the past.

For Holcim to do a test burn, it needs to modify its current Montana air quality permit. That is one of the major issues the DEIS addresses. Holcim submitted scientific and technical information to comply with the Clean Air Act of Montana. If DEQ decides the information demonstrates that Holcim can be expected to operate in compliance with air quality requirements, Holcim's permit will be modified. Holcim could then do a test burn to determine if the actual emissions from using tires as a fuel meet the requirements of the permit.

Purpose and Benefits

The primary purposes for burning tires are to lower operating costs and to increase operational flexibility. Holcim would be able to use different fuels or combinations of fuels.

Issues Identified During Scoping

The issues and concerns raised during public scoping are cumulative effects, particularly when considered with Holcim's use of smelter slag as an iron source in its kiln, alternatives, air emissions and dispersion modeling, public health, ecological risk, solid waste, and socioeconomics. Table ES-1 contains more detailed lists of issues.

Alternatives

DEQ considered several alternatives in the EIS.

Alternatives Considered and Eliminated

These alternatives were eliminated from further consideration because they did not meet the stated purpose and benefits of the Proposed Action, or were found to be unreasonable based on technical, logistical, and regulatory considerations, economics, potential resource impacts, and feasibility:

- Alternative fuels, such as municipal wastes;
- Conversion from wet to dry kiln;
- Alternative emission control technologies;
- Off-site tire storage; and
- Reduction in the percent of tires used.

No Action Alternative

Under the No Action Alternative, the tire storage facility and the conveyor system to the kiln would not be constructed. DEQ would not issue the solid waste license and would not modify the air quality permit.

Selected Alternative

The rules implementing MEPA (ARM 17.4.617) require that DEQ indicate a preferred alternative, if one has been identified. Stating a preference at this time is not a final decision. The preferred alternative could change in response to public comment on the Draft EIS, new information that becomes available, or new analysis that might be needed in preparing the Final EIS. At this time, DEQ does not have a preferred alternative. DEQ has tentatively selected the Proposed Action, which would be modified by permit conditions.

Rationale

Holcim has demonstrated compliance with all applicable statutes and rules, as required for permit issuance. Conditions and limitations contained in the permit ensure the facility can operate in compliance with all applicable rules and regulations. Slag use will be limited to no more than 15,000 metric tons (16,535 tons) in a "rolling" 12-month time period (a continuous 12-month period), and DEQ will encourage Holcim to find other sources of iron.

Therefore, the No Action Alternative would not be appropriate and would not provide the cost savings that is the goal of the Proposed Action.

Affected Environment

In 2000, the unincorporated portion of the Gallatin County had the most residents (31,470 people), with Bozeman having the next largest population. Forecasts for the county show its population will continue to increase for the next 30 years.

Gallatin County's services industry contained the most employees in both 2000 and in 1990 and also had the largest increase in employment during the decade. The largest concentrations of employment in that sector were in health, business, and legal services. Retail trade was the second largest industry. The manufacturing of talc and cement are the main industries in Three Forks.

Monitoring of groundwater around the Trident plant has been conducted semi-annually since 1992. Monitoring shows no trends in water quality for that period.

Existing air quality in Gallatin County is classified as attainment or in compliance with national or state standards (National Ambient Air Quality Standards [NAAQS] and Montana Ambient Air Quality Standards [MAAQS]). PM_{10} (particulate matter with an aerodynamic diameter of 10 microns or less) is a problematic pollutant for many parts of Montana, including the Gallatin Valley. PM_{10} comes from industrial sources, agricultural activities, forest fires, mining, road dust, and residential wood smoke. The PM_{10} areas of most concern in Gallatin County are Bozeman and Belgrade.

Several common wildlife species occur in the vicinity of the Trident facility, including bald eagle, cottontail rabbit, great blue heron, red fox, and red-tailed hawk. Special status species occurring within 10 km of the cement plant or having protection under the Endangered Species Act (ESA) include bald eagle (Threatened) and lynx (Threatened). Great blue heron rookeries are found just south of the Trident plant on the Gallatin and Jefferson rivers. No special status fish are documented. The State Historic Preservation Office records indicate that there are no recorded historic or archeological sites within the project site.
Seven certified organic producers were identified within the study area. An organic Community Supported Agriculture (CSA) fruit and vegetable farm was also identified in the study area.

Interstate 90, a principal arterial, is the primary east-west highway and provides access to Bozeman and Billings to the east, and Butte and Missoula to the west; it passes approximately

four miles south of the plant. Secondary Highways S-205 and S-286 are classified as major collector roads by the Montana Department of Transportation.

Impacts of the Selected Alternative

Potential impacts to the following resource areas were identified and are summarized in Table ES-2.

Air Quality

Holcim's air quality permit application included a demonstration of compliance with the applicable MAAQS and NAAQS for the criteria pollutants. Criteria pollutants would remain approximately the same, except that carbon monoxide would increase, but would still comply with MAAQS and NAAQS.

Modeling of hazardous air pollutants (HAP) indicates that annual average impacts would be highest at the boundary of the facility and then decrease. Some HAP emissions from the kiln, such as mercury, would increase, while others would remain approximately the same. Most kiln dust HAPs emissions would decrease.

Human Health Risk Assessment

Metals, and to a lesser degree, organic constituents, are predicted to accumulate in soils as a result of continued long-term emissions. Polycyclic aromatic hydrocarbon (PAH) levels are expected to approach the detection limit within 10 years, but reach a dynamic equilibrium and not increase in concentration with future emissions.

Acute and chronic exposure and hazards are below levels of concern. Lead exposures from emissions under baseline and cumulative conditions are below background levels. Cancer risk varies for the different scenarios evaluated. The highest risk is for a subsistence lifestyle scenario (persons who grow food on their property) at the facility property boundary. The most important exposure pathways would be mother's milk and beef ingestion. The lowest risks are for residents in Three Forks, Manhattan, and Belgrade who obtain their food from supermarkets.

There would be low risks from the consumption of fish from local rivers. Risk from eating fish from lakes and ponds, is strongly affected by assumptions regarding the location and configuration of water bodies. Risks from consumption of locally hunted big game are also low.

Risks for most residents are "negligible." In the analysis of individual chemicals, at the worst-case location, the risk from dioxin for the baseline condition and cumulative condition at both the average and high-end exposure levels is negligible.

Ecological Risk Assessment

The ecological risk assessment (ERA) found that 1) under either the No Action or Proposed Action alternative, air emissions from the Trident facility may pose a potential ecological hazard to some species at the point of maximum air concentrations; 2) any ecological risks would be restricted to small areas and would not have a significant impact on the overall ecological health

of the broader region surrounding the Trident facility; and 3) there is very little difference in ecological risk between the two alternatives.

Concentrations of chemicals of potential concern (COPC) in streams and lakes (including reservoirs, ponds, and wetlands) would be within Montana surface water quality standards and are therefore unlikely to pose any danger to aquatic life in streams even at the study area boundary where concentrations would be highest.
Estimated COPC concentrations in soils for the broader area surrounding the facility do not exceed any screening-level criteria for soils.

Land Use

Land uses in the local area would continue to be farming, ranching, and livestock grazing. The proposed use of tires would occur within a previously disturbed mining/industrial cement manufacturing facility.

The project would not result in a loss of recreational opportunities to the public. Recreational opportunities would continue on land in the vicinity of the plant, along the Missouri River, and within the Missouri Headwaters State Park.

Socioeconomics

Additional equipment would generate $14,200 in real property tax, which represents a 4 percent increase in Holcim's 2004 tax bill. About three-fourths of that tax (about $10,720) would go to Gallatin County, with the balance of that tax (about $3,480) going to the State of Montana.

There are four privately operated tire-only landfills in the State of Montana. The impact of Holcim using waste tires as fuel cannot be determined until Holcim secures a contract with a scrap tire supply source. The impact of the proposed project on existing tire-only landfills would depend on the source of scrap tires.

Holcim, or its tire contractor, could acquire scrap tires within Montana in two ways. The first would be from the existing tire-only landfills, and the impact on those landfill operations would be minimal. Secondly, Holcim, or its tire contractor, could compete for tires with the tire-only landfills. The impact of that competition would be significant. Acquiring scrap tires in state would have a direct adverse impact on revenue generated at the four facilities with secondary impacts on employment and wages at the tire-only landfills as well as property taxes attributable to those landfills.

Property Values

Property values appear resilient, particularly when there is sustained population growth. The value of large parcels in agricultural use is more likely to be affected by production and transaction factors (like availability of water and the costs of mortgage financing) than subtle changes in air quality. Property values in rural areas would be most affected by local employment opportunities.

Rural land values in the Gallatin Valley have appreciated. Land value within a 10-km radius of the Holcim/Trident plant might be lower, but not because of any influence by the plant, but because of poor soils or lack of water.

The evaluation and analysis also found that there is no empirical evidence to support concerns that property values would be adversely affected by the proposed change in the fuel mix at the Holcim/Trident cement plant.

Cumulative Impacts

Cumulative impacts result from the incremental impact of the Proposed Action when added to other past and present actions, and future actions under state review. Holcim has been using ASARCO smelter slag in its kiln as an iron source for the cement. Slag emissions were included in the analysis for the human health risk assessment and the ecological risk assessment.

Compliance with Air Quality Standards

The addition of tires to the kiln fuel mix is expected to cause an increase in carbon monoxide (CO) emissions, while emissions of the other criteria pollutants would remain the same or decrease. The CO emissions would still comply with MAAQS and NAAQS.

Cumulative Impacts for Risk Assessment

Some HAP emissions would increase while others would decrease or remain about the same.

Human Health Effects

- **Acute (short-term) Noncarcinogenic Hazards -** The quantitative assessment of acute hazards indicated no known risk from acute exposure to ground-level air concentrations. These results were applicable to both the general population and facility workers.

- **Chronic (long-term) Noncarcinogenic Hazards -** The hazard indices for both the average and high-end exposures were below the amount considered as not acceptable, indicating no expected hazard from chronic exposure.

- **Blood-Lead Levels -** The predicted blood-lead levels in children due to exposures to lead are below the standard used by EPA.

- **Carcinogenic Risks -** The change in risk at the facility property boundary (the worst-case location), which represents the aggregate of all pollutants, is at Montana's "negligible risk level."

Land Use

NorthWestern Energy is building a 161-kV transmission line from the Three Rivers Substation, north of Three Forks, to the Jackrabbit Substation, west of Bozeman and south of Belgrade. Additional industrial projects were not identified in the vicinity of the plant site.

Transportation

The Proposed Action would increase traffic and vehicle-related air emissions in the plant area. Traffic could also increase in the area as a result of transporting livestock to a proposed concentrated animal feeding operation. Because the Missouri Headwaters State Park is located near the facility, seasonal traffic volume variations would be expected in the area due to park visitors. Visitation to the park has also increased in the last few years and is expected to further increase as a result of the Lewis and Clark Expedition Bicentennial. Cumulative impacts in the area would occur as a result of increased traffic associated with the Proposed Action in conjunction with increases in traffic associated with the Lewis and Clark Expedition Bicentennial.

Water, Soil, and Wildlife

Prior to the mid-1970s, the drainage and destruction of wetlands were accepted practices in the United States and were even encouraged by specific government policies. Past and present activities include Holcim and its predecessors operating a portland cement plant at the current location for nearly 100 years. In addition, a century or more of agricultural and mining activities have affected water quality and water use in the area, as well as soils.

The ERA found that COPC concentrations in soils and water, following 100 years accumulation from Holcim's emissions, would exceed, or be within an order of magnitude, of toxicity reference values (TRVs) for several representative species or food groups of species. Continued emissions of these COPCs would increase impact levels associated with Holcim emissions.

The project would not destroy or degrade any wildlife habitat nor directly result in any mortality of individual animals. Indirectly, increased traffic would pose a danger for wildlife crossing highways. This includes both game and non-game species. This is not likely to have a substantial effect on local populations. There are no other existing facilities or anticipated projects in the vicinity that would contribute to potential effects associated with COPC deposition.

Conclusions

With the proposed permit limits on the number of tires that can be burned and the amount of slag that can be added to the kiln, carbon monoxide emissions will increase slightly and the other criteria pollutant emissions will be unchanged or will decrease. HAP emissions will also be controlled. Under these limits, the total risks from burning tires and adding slag are essentially identical to the risks associated with the present operation without tires.

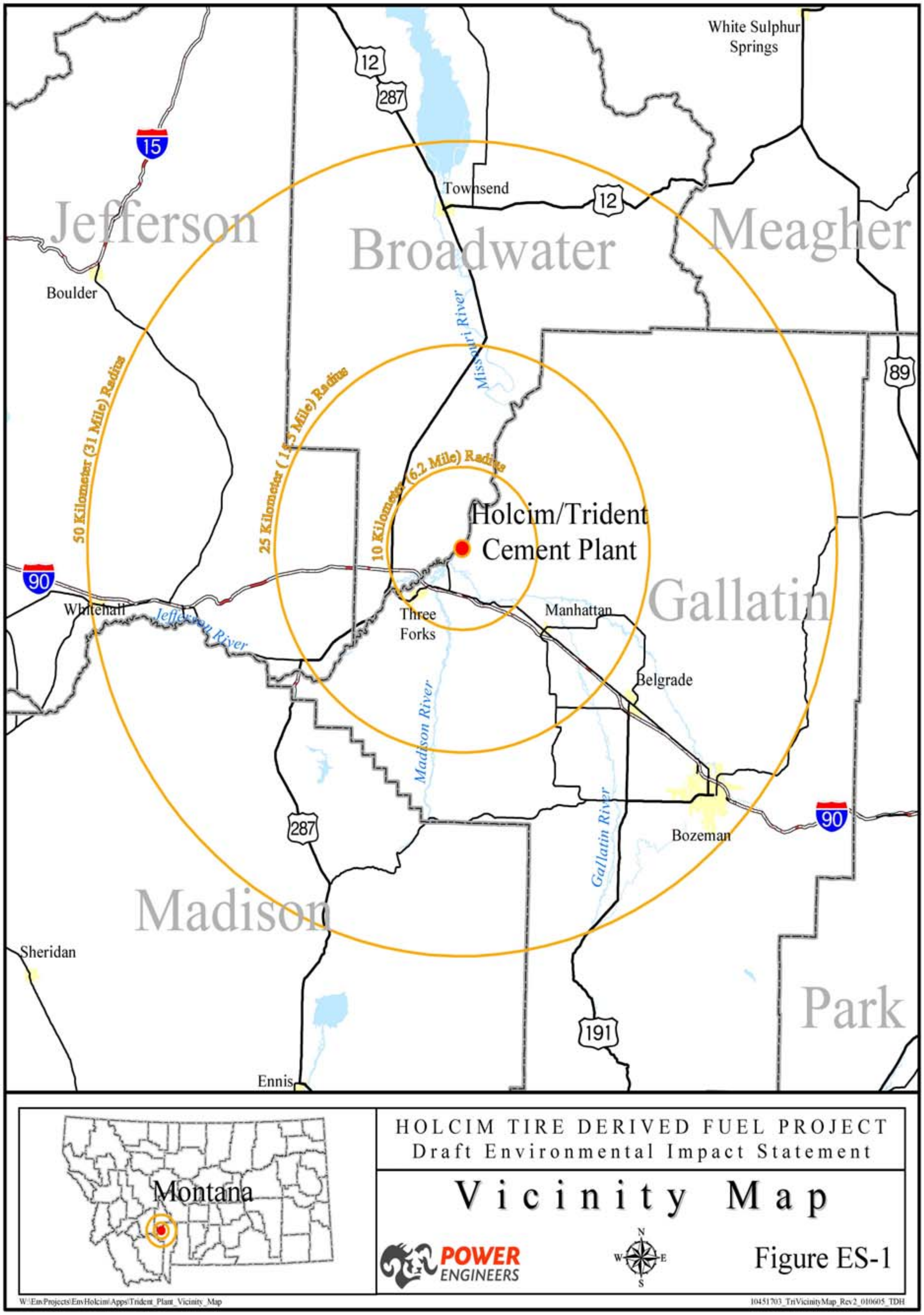

White Sulphur Springs
Townsend
Jefferson
Broadwater
Meagher
Boulder
Missouri River
50 Kilometer (31 Mile) Radius
25 Kilometer (15.5 Mile) Radius
10 Kilometer (6.2 Mile) Radius
Holcim/Trident Cement Plant
Gallatin
Whitehall
Jefferson River
Three Forks
Manhattan
Belgrade
Madison River
Gallatin River
Bozeman
Madison
Sheridan
Park
Ennis
12
287
15
90
89
191
Montana
HOLCIM TIRE DERIVED FUEL PROJECT
Draft Environmental Impact Statement
Vicinity Map
POWER ENGINEERS
Figure ES-1

Table ES-1 Issues Identified During Scoping

Cumulative Effects

- Existing criteria and hazardous air pollutants (HAPs) or other non-regulated pollutant emissions
- Existing emissions from the Trident facility
- Other area sources combined with the proposal to use tires as a fuel source in the cement kiln

Alternatives

- Other methods of current tire disposal
- Alternative ways to recycle tires; potential for conversion from a wet-process kiln to a dry-process kiln
- A No Action Alternative

Air Emissions and Dispersion Modeling

- Health risks from current emissions, plus emissions from tire combustion
- Ways to decrease hazardous air emissions
- New air dispersion modeling
- Transparency of the air emissions analysis
- Information presented from existing small wet-process kilns
- Need for a complete existing emissions inventory for criteria pollutants, as well as HAPs
- A thorough independent analysis of Best Available Control Technology (BACT) options
- Evaluate and consider the effects of kiln combustion efficiency on volatile organic compounds (VOCs), PAHs, dioxins, and products of incomplete combustion (PIC) and these effects on human health
- Holcim Trident facility's regulatory compliance history; the proposed modifications to the facility; upset conditions for both acute and chronic exposures; emissions from glass combustion; data for pollutants of concern; the need for a backup system for controlling particulates when the electrostatic precipitator (ESP) is not operating
- Emissions from the Luzenac talc mill, a major source of emissions in the immediate area

Public Health • Potential for short- and long-term impacts on public health; risk assessment should consider the cumulative risk of baseline (existing emissions) plus tires • Human exposure to dioxin and other hazardous air pollutants
Ecological Risk • The potential for economic impacts and water quality impacts from air dispersion and runoff on Arctic grayling reintroduction • Impacts to water quality • Potential pathways for hazardous air emissions to impact aquatics in Missouri headwaters • Potential bioaccumulation risks to humans from ingestion of fish and meat from local game populations • Potential impacts to the great blue heron rookery, bald eagle nests, and other resident species near Holcim's Trident facility • Impacts to animals larger than the red fox (e.g., deer and antelope)
Solid Waste • Potential for tire moisture and infectious disease vectors • Older tires • Holcim's fire suppression plan • Importation of tires from other states
Socioeconomics • Tax incentives and the impact of such incentives on state and county tax revenues • Economic impacts to business, tourism, building construction, and agricultural, livestock, and dairy operations • Impacts to property values • Emissions and deposition impacts on organic farming

Table ES-2 Summary of Impacts

	Proposed Action	No Action
Air Quality	Some HAPs emissions from the kiln, such as mercury, would increase, some would decrease, and others would remain about the same.	No change from existing emissions.
	Most kiln dust HAPs emissions would decrease.	No change from existing emissions.
	Criteria pollutants would remain about the same, except that CO would increase but would still comply with MAAQS and NAAQS.	No change from existing emissions.
	Peak 1-hour dispersion coefficients (ratio between ambient concentration and emission rate) would decrease by a factor of 100 from the plant property boundary to Bozeman. Annual average dispersion coefficients would decrease by the same factor.	Same as the Proposed Action.
Human Health Risk	Non-cancer hazard quotients and indices would be less than 1.0.	Same as the Proposed Action.
	Blood lead levels at the worst-case location would be 12 percent of EPA's recommended limit.	Same as the Proposed Action.
	Cancer risk for individual pollutants at the worst-case location (plant property boundary) would not exceed 1×10^{-6} under the average exposure scenario. Cancer risk for individual pollutants and the aggregate of all pollutants would not exceed Montana's negligible risk level for communities in the Three Forks to Bozeman area under the average and high-end exposure scenarios.	Same as the Proposed Action.
	Cancer risk from eating 74 pounds per year of fish caught locally from rivers (high-end exposure scenario) would be below 1×10^{-6}.	Essentially the same as the Proposed Action.
	Cancer risk from eating a substantial amount of fish caught from local ponds over a lifetime could result in risk of greater than $1 \times 10^{-6}$for individual pollutants (principally dioxin and PCBs), depending o the location, configuration, and hydrologic properties of the pond.	Essentially the same as the Proposed Action.
	Cancer risk from eating, over a lifetime, as much as 126 pounds per year of deer killed in the area would be below 1×10^{-6}.	Essentially the same as the Proposed Action.
Ecological Risk	Hazard index for carnivorous birds (e.g., red-tailed hawk) would be as high as 7 at the worst-case location, and the hazard index for avian omnivore (e.g., robin) would be as high as 1, depending on input assumptions. Hazard index at the worst-case location for all other plant and animal groups would be less than 1. For the area surrounding the facility, hazard indices for all species are below 1, indicating no hazard to the broader ecosystem.	Same as Proposed Action except robin would be 1.0.
Transportation	Daily truck trips would increase by 3.6 per day (1,300 per year), about 0.5% of current traffic level.	No additional truck traffic.
Property Taxes	An additional $10,720 for Gallatin County and $3,480 for the state.	No change in property tax revenue.

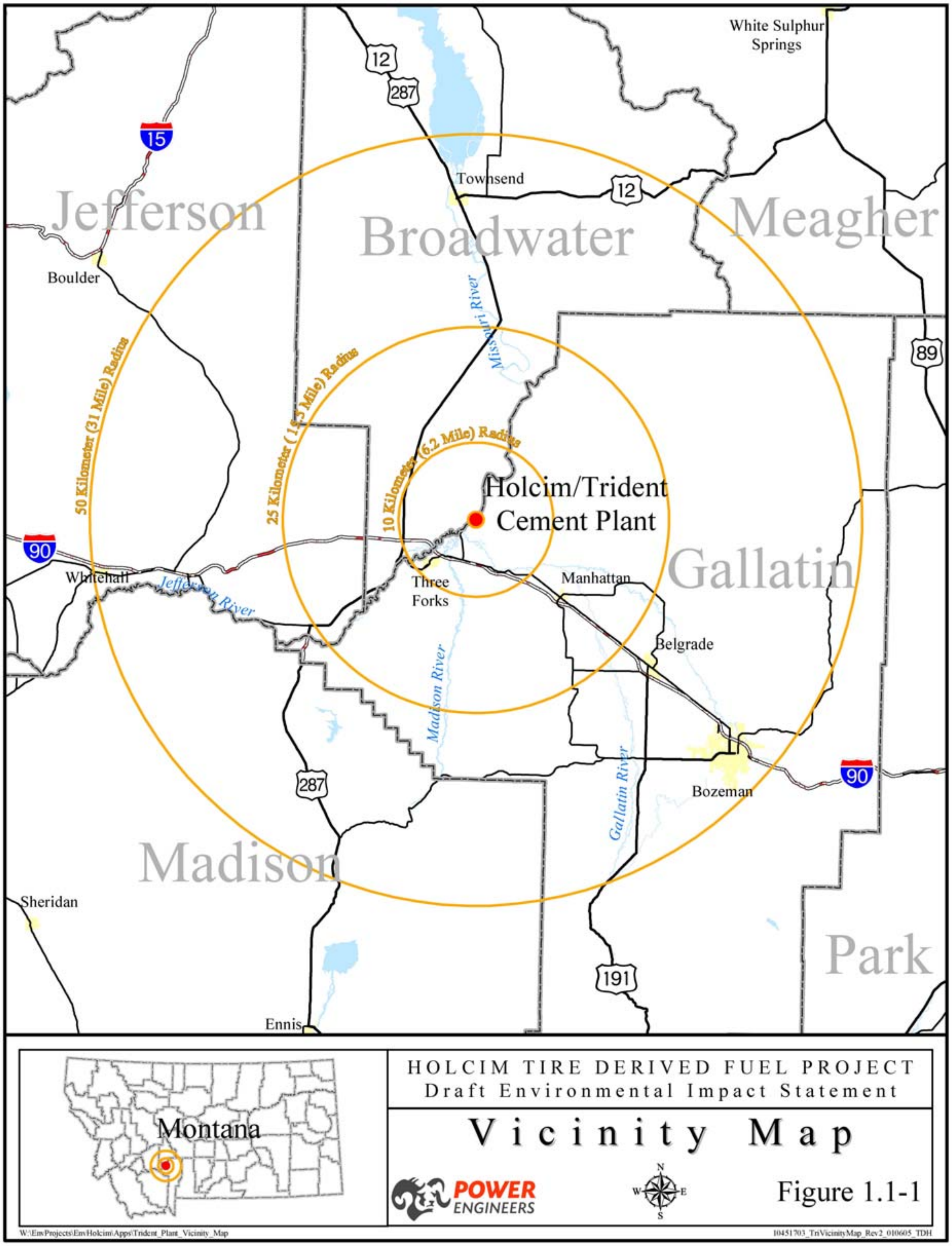
CHAPTER 1
PURPOSE AND BENEFITS

1.1 Introduction

This chapter describes the Montana Department of Environmental Quality (DEQ) actions regarding Holcim (US) Inc.'s (Holcim) proposed mid-kiln combustion of tires to supplement up to 15 percent of the required fuel for the kiln at its portland cement manufacturing facility in Trident, Montana. The public participation process and issues of concern raised during scoping for this environmental impact statement (EIS) are summarized.

Holcim requested a modification to its current Montana Air Quality Permit #0982 to allow the mid-kiln combustion of whole tires at its Trident facility. The tires would replace up to 15 percent of the traditional fuels used by the plant. Holcim's current air quality permit authorizes combustion of up to 100 percent natural gas, 100 percent coal, 100 percent petroleum coke, or any combination of these fuels. Holcim's primary objective for seeking a modification of its existing air quality permit is to realize reductions in fuel and operating costs of approximately 3 percent per year (DEQ 2001). The Holcim Trident facility is in Gallatin County near the Missouri Headwaters, approximately 5 miles northeast of Three Forks, Montana. A map showing the location of the Trident facility and surrounding area is presented as Figure 1.1-1.

Figure 1.1-1 VICINITY MAP



1.2 History of Application Review and Need for EIS

Holcim submitted an application to modify Permit #0982 on October 3, 2001, to DEQ's Air Resources Management Bureau, Permitting and Compliance Division. Between October 2001 and March 2003, DEQ conducted reviews and requested supplemental information and clarifications from Holcim. On March 24, 2003, DEQ issued a Preliminary Determination for the modification to Permit #0982 and a Draft Environmental Assessment (EA) pursuant to the Montana Environmental Policy Act (MEPA; Title 75, Chapter 1, MCA) and its implementing rules (ARM 17.4.601 *et seq.*). A public hearing on the Preliminary Determination and the Draft EA was held in Manhattan, Montana, on April 29, 2003.

Numerous comments were received during the public comment period (March 24 through May 30, 2003). DEQ considered these comments and issued a Final EA on August 15, 2003. In the final EA, DEQ concluded that an EIS would be required for the project. The rationale for this decision was presented in the Final EA and summarized as follows (DEQ, August 15, 2003):

- An environmental impact statement (EIS) is required because the potential impacts from the proposed project, in conjunction with current Holcim activities, may significantly affect the quality of the human environment. Public comment also identified cumulative impacts as a major issue regarding this proposed project. MEPA requires that this cumulative impact analysis be conducted before a decision can be made on the permit applications (Solid Waste License and Modification to Air Permit).
- In summary, the use of TDF [tire-derived fuel] at Holcim's Trident Facility is a major issue for the surrounding area and for Montana. An EIS would enable the Department to more completely identify and disclose the potential cumulative impacts on human health and the environment from Holcim's facility, determine whether any of those impacts are significant, and, if so, identify any potential measures for mitigating those impacts. Therefore, an EIS is required for Holcim's application to use TDF at its Trident Facility.

1.3 Proposed Agency Action

DEQ is considering two permitting actions. The first action would be to issue Holcim a solid waste management system license for the storage of tires prior to incineration under the Montana Solid Waste Management Act (75-10-221, MCA). Because Holcim would collect and store waste tires, which are defined as a solid waste under 75-10-203(11)(a), MCA, the Trident plant would be considered a Class III Resource Recovery facility under the Montana Solid Waste Management Act. The second action would be to modify Holcim's existing Permit #0982 to allow for mid-kiln combustion of tires at the Trident facility with conditions on the use of smelter slag as an iron source.

Holcim submitted its application to incinerate tires under the requirements of 75-2-215, MCA. Under these requirements, DEQ may not issue an air quality permit unless it determines that the proposed use of tires as fuel would constitute no more than a negligible risk to the public health, safety, and welfare, and to the environment.
If DEQ determines that Holcim's applications meet the requirements of the Montana Solid Waste Management Act, the federal Clean Air Act, and the Clean Air Act of Montana and their implementing rules, the solid waste license will be issued and the air quality permit will be modified. Conditions may be applied to reduce or eliminate environmental impacts.

This EIS has been prepared to comply with MEPA and with DEQ's determination that an EIS is needed.

1.4 Existing Operations

Holcim operates a "wet process" kiln, in which the raw kiln feed material is blended with water to promote homogenization. The mixture is fed into the kiln as slurry rather than as dry ingredients. The kiln is fired by injection of fuel at the lower end to maintain a combustion zone with very high temperatures. Currently Holcim uses a combination of coal, natural gas, syncoal (defined as a process consisting of thermal treatment coupled with physical cleaning to upgrade high moisture low rank coal) and petroleum coke as fuel (Holcim, 2004). See Section 2.2 for a description of the cement-making process.

1.5 Proposed Changes to Use Tires as Fuel

Holcim is proposing to combust tires as fuel in the Trident kiln. The proposal would substitute whole tires for up to 15 percent of the total heat input, on a British thermal unit (Btu) basis. The proposed physical changes include the development of an on-site tire storage area and modification of the kiln to allow for the insertion of tires.

Tires would be delivered and stored in trailers in the quarry prior to delivery to the kiln. A maximum of 15,000 tires would be stored on site at any given time. The tires would be unloaded from the trailers onto a conveyor automatically with a trailer lift. The conveyor would feed the tires to a mechanism that would insert one tire at a time into the kiln at specified time intervals. A gate would be installed into the kiln shell that would allow tires to be dropped into the calcining zone of the kiln. Holcim has projected that 1,137,539 tires could be combusted each year. This equates to a maximum estimate of 94,795 tires, or 950 tons, each month. Holcim has estimated the cost of facility improvements to combust tires as fuel at $1,000,000 (Holcim, 2004).

1.6 Purpose and Benefits

Holcim stated that the primary purpose in seeking approval for the mid-kiln combustion of whole tires is to realize lower operating costs and to increase operational flexibility (Holcim, 2004). The current annual average fuel cost at the Trident facility for burning coal, natural gas, and coke is $1,450,000 (Ralph Denoski, personal communication). Incineration of up to 1,137,539 tires per year as a supplemental fuel would result in an annual cost savings of up to $250,000 or 17 percent of the total fuel costs for the facility. Holcim would have the operational flexibility to use different fuels or combinations of fuel at its discretion or based on fuel availability and costs.

Holcim stated that the combustion of tires would allow it to reduce production costs to a level comparable to other facilities, maintain its existing share of the portland cement market, and create a use for a waste material (Bison, 2000).

Several recent studies evaluated the use of tires as a fuel alternative or to supplement other fuels (UC Davis, 1996; EQC, 1998). The Montana Environmental Quality Council (EQC) study cites statistics from the Scrap Tire Management Council (STMC) that indicate the most significant growth market for tires has been as fuel for incineration. In 1996, approximately 152 million of

the estimated 266 million tires generated in the U.S. were incinerated as supplemental fuel at 107 facilities. These facilities included 36 cement kilns, 23 pulp and paper facilities, 15 electric utilities, and 33 other industrial and electric generating facilities.

Tires have been used as fuel since the 1970s in North America, Europe, and Japan, according to the California Integrated Waste Management Board (CIWMB, 1992: 24-27). Tires have several properties that make them attractive for potential energy usage. They contain 12,000 to 16,000 Btu/pound, depending upon composition and whether or not steel has been removed (CIWMB, 1992: 11-12). An 18-pound tire contains the energy equivalent of approximately 2 gallons of gasoline. In comparison, bituminous coal has a slightly lower heat and energy value, ranging from 11,000 to 13,000 Btu/pound. Tires also have lower moisture content than coal.

Cement kilns burned nearly 30 percent of the total number of tires used for fuel in 1996 (STMC, 1996; STMC, 1997). An Environmental Protection Agency (EPA) report (EPA, 1991) concluded that cement kilns appear to be particularly suitable for the incineration of tires for several reasons. The combustion at high temperatures and long fuel retention times may minimize the need and expense for additional air emission controls other than control for particulates. Kilns require large quantities of fuel, and are capable of being easily modified to include tires in the fuel stream. Cement kiln facilities near Montana that burn tires as supplemental fuel include the Ash Grove Cement kilns in Inkom, Idaho; Durkee, Oregon; Leamington, Utah; and Seattle, Washington. Ten Holcim facilities nationwide are using tires as fuel, including facilities at: Devil's Slide, Utah; Seattle; and Portland, Oregon. Presently, forty-three cement kilns are permitted to burn tires in the United States. No permit application for this use has been denied.

Other reasons and advantages that have been cited for using tires as fuel in cement kilns include:

- Burning whole tires can be attractive economically by reducing fuel costs. Many existing systems can accommodate tire fuel without significant facility modifications. Costs associated with the modifications to burn whole tires in cement kilns are minor in most cases. The cost of tires as fuel can be 70 to 90 percent less than the cost of the primary fuel, depending on geographical location (EPA, 1993). EPA reports cost savings to several cement manufacturers from using tires as a fuel supplement. In one case, tire costs were 34 percent of the cement manufacturer's coal cost on a dollar per Btu basis.
- Cement kiln processes operate at high temperatures and with long residence times and kiln turbulence — conditions that usually minimize the production of metal or other toxic residues. The objective when burning tires in cement kilns is to achieve nearly complete combustion of all organic materials in the fuel so that the complex organic compounds do not become part of the air emissions.
- Non-combustible tire components (e.g., metals) become part of the cement clinker and reportedly do not contribute to air emissions or to waste ash (CIWMB, 1992:24-27).
- Nitrogen oxide (NO_x) emissions usually decrease when tires are burned (CIWMB, 1992:24-27).
- Tires are used in place of coal because they have higher energy by weight (California EPA, 2002).
- Kilns can in some cases charge a disposal fee that is lower than the fee at landfills.
- The steel belts in the tires offer a source of iron needed in the cement making process (California EPA, 2002).

1.7 Regulatory Requirements and Health Guidelines

1.7.1 Regulatory Requirements

An environmental review pursuant to MEPA must be prepared whenever a state agency may take an action that could affect the human environment and that is not exempt from review by statute or rule. State actions include issuance of permits and licenses. The principal purpose of this EIS is to disclose the primary, secondary, and cumulative impacts of permitting Holcim to store and combust whole tires. The EIS also identifies potential alternatives and mitigation measures. Section 1.3 describes the permitting action that DEQ is considering. A decision on the air quality permit modification and the solid waste management license will not be made until the completion of the Final EIS.

In addition to this EIS, there are a number of regulatory requirements under state statutes and rules and EPA regulations that pertain to the proposed modification at Holcim's Trident facility.

Table 1.7-1 Regulatory Requirements of EPA and State of Montana

Rule Citation	Description
ARM 17.8.101 *et seq.*	General Provisions (Clean Air Act of Montana)
ARM 17.8.212	Ambient Air Quality Standards
ARM 17.8.304	Visible Air Contaminants
ARM 17.8.308	Particulate Matter, Airborne
ARM 17.8.309	Particulate Matter, Fuel Burning Equipment
ARM 17.8.310	Particulate Matter, Industrial Process
ARM 17.8.322	Sulfur Oxide Emissions- Sulfur-in-Fuel
ARM 17.8.340 40 CFR 60 Subpart F	New Source Performance Standards (NSPS)
ARM 17.8.342 40 CFR 63 Subpart LLL	Maximum Achievable Control Technology (MACT)
ARM 17.8.402	Stack Heights and Dispersion Techniques
ARM 17.8.501 *et seq.*	Air Quality Permit Application, Operation, and Open Burning Fees
ARM 17.8.740 *et seq.*	Permit for Construction and Operation of Air Contaminant Sources
ARM 17.8.752	Best Available Control Technology (BACT)
ARM 17.8.759	Public Review of Permit Application
ARM 17.8.801 *et seq.*	Prevention of Significant Deterioration (PSD)
ARM 17.8.1201 *et seq.*	Operating Permit Program
75-2-215, MCA	Incinerator Permitting
ARM 17.50.505	Standards for Solid Waste Management Facilities
ARM 17.50.508	Application for Solid Waste Management System License
ARM 17.50.509	Operation and Maintenance Plan Requirements
75-10-216, MCA	Waste Tire Disposal Sites – Financial Assurance Required
75-10-221, MCA	Solid Waste Permitting

1.7.2 Health Risk Assessment Guidelines

A risk assessment was completed by DEQ to support the development of the EIS. The following information was used as methodology for the development of the risk assessment.

EPA and ATSDR

The Agency for Toxic Substances Disease Registry (ATSDR) in conjunction with the EPA has provided information regarding content and use of health risk assessments (ATSDR, 2005). An excerpt of the information is provided in the following paragraphs:

A risk assessment is an analysis that uses information about toxic substances at a site to estimate a theoretical level of risk for people who might be exposed to these substances. The information comes from scientific studies and environmental data from a site. A risk assessment provides a comprehensive scientific estimate of risk to persons who could be exposed to hazardous materials present at a site.

Risk assessments, prepared by EPA and other agencies, are used to determine if levels of toxic substances at hazardous waste sites pose an unacceptable risk as defined by regulatory standards and requirements. The risk assessment helps regulatory officials determine hazardous site cleanup strategies that will ensure overall protection of human health and the environment.

> A risk assessment does not measure the actual health effects that hazardous substances at a site have on people. Risk assessments often are conducted without considering actual or possible exposure. Conservative safety margins are built into a risk assessment analysis to ensure protection of the public. Therefore, people will not necessarily become sick even if they are exposed to materials at higher dose levels than those estimated by the risk assessment. In other words, during the risk assessment analysis, the most vulnerable people (e.g., children and the elderly) are carefully considered to make sure all members of the public will be protected.

The risk assessment helps answer these three questions for people who might be exposed to hazards at a site:

Under what circumstances might I and my family and neighbors be exposed to hazardous substances at this site?

Is it possible that we might be exposed to hazardous substances at levels higher than those determined to be safe?

If the levels of hazardous substances are higher than regulatory standards, how low do the levels have to be for the risk to fall within regulatory standards?

A memorandum prepared by D.R. Clay at the EPA (EPA, 1991) describes the role of the baseline risk assessment in Superfund remedy selection. The memorandum states that EPA may use the results of the baseline risk assessment to determine whether a release or threatened release poses an unacceptable risk to human health or the environment that warrants remedial action and to determine if a site presents an imminent and substantial danger. The memorandum further states that where the baseline risk assessment indicates that a cumulative site risk to an individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 10^{-4} (1 in 10,000) lifetime excess cancer risk, action under CERCLA is generally warranted at the site. EPA uses the general 10^{-4} to 10^{-6} risk range as a "target range" within which the agency strives to manage risks as part of a Superfund cleanup.

California EPA

The California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) states in *"A Guide to Health Risk Assessment"* (OEHHA, 2004) that regulators assume that a 1 in 1 million (10^{-6}) risk of cancer from lifelong exposure to a chemical is an "acceptable risk level" because the risk is extremely low compared to the overall cancer rate. If a standard for a chemical was set at the 1 in 1 million risk level, it would mean that no more than one additional cancer, beyond what would normally occur in a population, would potentially occur in a population of 1 million people over a 70-year lifespan.

Administrative Rules of Montana

ARM 17.8.770 requires a human health risk assessment for the modification to Holcim's air quality permit. Specifically:

> An applicant for a Montana air quality permit for an incineration facility subject to 75-2-215, MCA, shall submit a human health risk assessment protocol and a human health risk assessment as part of the application. The human health risk assessment must demonstrate that the ambient concentrations of pollutants resulting from emissions from the incineration facility subject to 75-2-215, MCA, constitute no more than a negligible risk to the public health, safety, and welfare and to the environment.

A negligible risk to the public health is defined in ARM 17.8.740 as follows:

> Negligible risk to the public health, safety, and welfare and to the environment means an increase in excess lifetime cancer risk of less than 1.0×10^{-6}, for any individual pollutant, and 1.0×10^{-5}, for the aggregate of all pollutants, and an increase in the sum of the non-cancer hazard quotients for all pollutants with similar toxic effects of less than 1.0, as determined by a human health risk assessment conducted according to ARM 17.8.767.

1.8 Public Participation

As described in Section 1.2, Holcim submitted the initial application for modification of Permit #0982 on October 3, 2001, and DEQ held a public information meeting at Manhattan High School on December 18, 2001. The public scoping period for the EIS extended from December 17, 2003, to January 23, 2004. DEQ held a public scoping meeting on January 20, 2004, at the Manhattan Elementary School. About 100 people attended the scoping meeting, and about 1,500 comments were received during the scoping period.

Both oral and written comments were submitted at the two public meetings. Interested persons, groups and local and state government agencies also submitted comment letters and e-mail messages. DEQ prepared a scoping summary report that summarizes by topic substantive comments received from December 2001 through the EIS scoping period. The comments were reviewed and considered in the development of the list of issues addressed in this EIS.

1.9 Issues to be Addressed

Concerns have been raised regarding the use of tires as fuel in cement kilns. There are environmental health concerns about the potential increase in emissions of criteria pollutants, such as CO, and particulates, HAPs, and toxic air pollutants, such as PAHs, dioxins, and furans. The type and amount of emissions produced by burning tires with coal and other fuels depend on the completeness of combustion (combustion efficiency), which is dependent on temperature, residence time in the kiln, oxygen levels, and the degree of turbulent mixing within the kiln. Although the temperature and residence time are high in cement kilns, there are often unknowns regarding potential changes in the temperature gradient inside a kiln associated with physical and operational modifications to handle the burning of tires. If not properly designed and operated, the kiln may not achieve the combustion efficiency needed to fully burn the tire fuel. As long as there are no changes in the location, percentage, or manner in which the tires are fed into the

kiln, the emissions should not vary any more than what would be expected with coal. All of these factors can also affect the quality of the cement. Consistent quality of cement is important to the company to maintain its customers, so management has a stake in maintaining the *status quo* (BCPH, 2003). Incomplete combustion could increase emissions of PAHs and toxic organic compounds, such as dioxins and furans. Process upsets, equipment malfunctions, and any periods when pollution control equipment is not on line can also increase emissions.

The specific emissions from a given cement kiln burning tires also depend upon some combination of the following:

- Type of cement process (wet or dry) and the pollution control methods and technologies used
- Percent substitution of whole tires for the principal fuel
- Point in the process at which tires are fed into the kiln
- Quality (including moisture and metal content) and form (chips or whole tires) of the tire fuel

The following is a summary list by category of issues raised by the public:

Cumulative Impacts

- Except for dioxin, the analyses presented by Holcim in the application to modify the existing air permit and evaluated in the EA were based only on the emissions from the use of tires for fuel and did not consider existing criteria and HAPs or other non-regulated pollutant emissions.
- The cumulative analysis should consider existing emissions from the Trident facility and other area sources combined with the proposal to use tires as a fuel source in the cement kiln.
- Air modeling should consider existing emissions and tire fuel emissions. Deposition isopleths (mapped distribution of potential pollutant deposition) should be prepared for cumulative emissions.
- The health risk assessment and ecological risk assessment should consider cumulative emissions and predict cumulative impacts.

Alternatives

- Alternatives to burning tires should be considered.
- How are tires currently disposed of in Montana?
- Other ways to recycle tires besides burning them as fuel in cement kilns should be considered.
- Evaluate conversion from a wet-process kiln to a dry-process kiln.
- Evaluate a No Action Alternative: the existing operation would continue without granting the permit modification and without burning tires.

Air Emissions and Dispersion Modeling

- Consider current emissions plus emissions from combustion of tires when assessing health and environmental risks.
- Analyze ways to decrease hazardous air emissions.
- Conduct new air dispersion modeling.

- The characterization of emissions from sources other than the stack is inadequate. Consider emissions from the clinker cooler and other sources.
- The air emissions analysis needs to be made transparent.
- Information should be presented from existing small wet-process kilns.
- There should be a complete existing emissions inventory for criteria pollutants as well as HAPs.
- Undertake a thorough independent analysis of available BACT options.
- Evaluate effects of kiln combustion efficiency on VOCs, PAHs, dioxins, and products of incomplete combustion (PIC). Consider these effects in the human health risk assessment.
- Consider the Holcim Trident facility's regulatory compliance history.
- Present specifications for the proposed modifications to the Trident facility to allow the use of tires as fuel.
- Conduct a thorough review of impacts and emissions from operations under upset conditions for both acute and chronic exposures.
- Emissions from glass combustion need to be considered along with the other emissions.
- Holcim's emissions from tire burning evaluated in the EA were predicted through the use of data from other cement plants of varying sizes and different process, using a variety of fuel types. Data were not presented for many pollutants of concern.
- There should be a backup system for controlling particulates when the electrostatic precipitator (ESP) is not operating.
- Consider in the cumulative emissions inventory and analysis emissions from the Luzenac talc mill, a major source of emissions in the immediate area.

Public Health

- Evaluate potential for short- and long-term impacts on public health.
- The original health risk assessment only considered the tire emission increment. The risk assessment should consider the cumulative risk of baseline (existing emissions) plus tires.
- There should be a comprehensive and transparent analysis of human exposure to dioxin and other hazardous air pollutants.

Environmental Impacts and Ecological Risk Assessment

- Perform the ecological risk assessment again.
- Assess the potential for economic impacts and water quality impacts from air dispersion and runoff on Arctic grayling reintroduction.
- Assess whether the Proposed Action will impact water quality.
- Assess the potential pathways for hazardous air emissions from tire combustion to impact aquatics in Missouri headwaters.
- Evaluate the potential bioaccumulation risks to humans from ingestion of fish and meat from local game populations.
- Evaluate the potential impacts to the great blue heron rookery, bald eagle nests, and other resident species near Holcim's Trident facility.
- The ecological risk assessment did not consider impacts to animals larger than the red fox (e.g., deer and antelope).

Solid Waste

- Discuss Holcim's plan for excluding tires with moisture and infectious disease vectors.
- Discuss whether older tires will be excluded from incineration.

- Present and evaluate Holcim's fire suppression plan.
- Evaluate importation of tires from other states.

Socioeconomics

- Discuss whether Holcim will receive tax incentives and the impact of such incentives on state and county tax revenues.
- Consider whether there would be economic impacts to business, tourism, building construction, and agricultural, livestock, and dairy operations.
- Evaluate the potential for impacts to property values.
- Evaluate whether emissions and deposition will have impacts on organic farming.

CHAPTER 2
DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 Overview

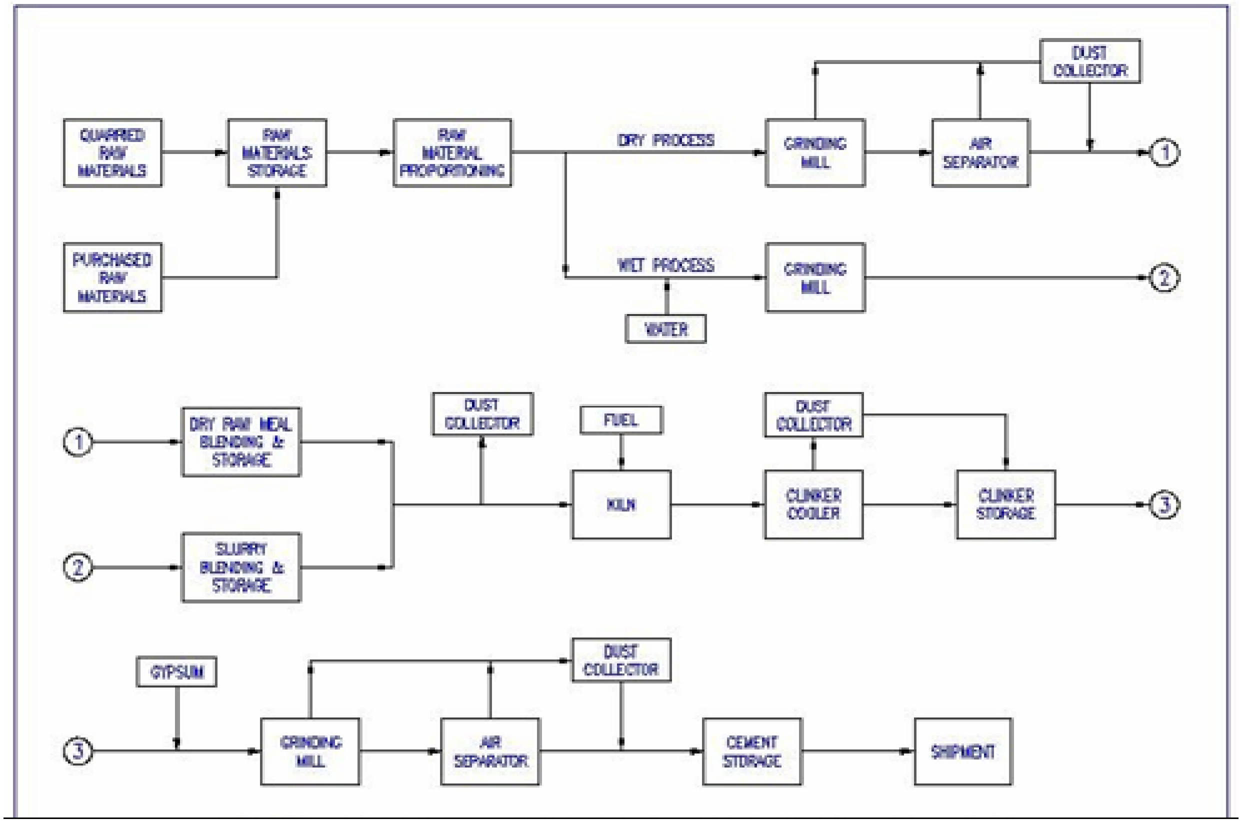
This section describes the Proposed Action and the process of developing and selecting reasonable alternatives. Each potential alternative was evaluated considering the purpose and benefits of the Holcim proposal to use tires as fuel. The alternatives were also evaluated in terms of their ability to meet technical, environmental, and economic feasibility criteria. A range of alternatives was evaluated and placed into the following categories:

- Proposed Action describes the Holcim proposal to use whole tires as fuel and the activities needed to implement it.
- No Action alternative discusses the current situation by assuming the air quality permit would not be modified and tires would not be burned in the kiln. DEQ would not license the site as a Class III resource recovery facility.
- Alternatives Considered and Eliminated describes the alternatives examined but eliminated from detailed study. Alternatives considered but eliminated include using processed tires, other waste as fuel, other fuels, conversion from a wet to dry kiln process, alternative pollution control technologies, alternative tire storage, and reduction in the percentage of tires used as fuel.

2.2 Existing Facilities and Operations

Holcim uses a combination of limestone, shale, and sandstone from its quarry, glass as a sand substitute, and iron components (iron ore and ASARCO smelter slag) to produce portland cement at the Trident facility. A basic flow diagram of the manufacturing process is provided in Figure 2.2-1 (Air & Waste Management Association, 1992). The rock is blasted, loaded into trucks, conveyed to the primary crusher, and transported to the storage silos or to a ground stockpile. The raw materials are conveyed from the primary crusher and delivered by enclosed conveyors to selected storage silos. From these silos, the raw materials are conveyed to the raw ball mill where they are ground with water to form a slurry and sent to a storage tank. From the tank, the slurry is sent to the kiln for high temperature processing into clinker. There is a precipitator on the exit end of the kiln that discharges to a screw conveyor then to a dust storage silo. The dust storage silo has a dustless unloader. The ash is disposed of in the quarry (DEQ, 2004).

Figure 2.2-1 Basic Process Flow Diagram



Source (AWMA, 1992)

The 450-foot-long rotary kiln is inclined at a 3 percent slope (Figure 2.2-2). Slurry with an average water content of 33 percent is pumped into the uphill, cooler end of the kiln. The kiln is rotated and the slurry is gravity-fed towards the hot end of the kiln, gradually increasing in temperature until it reaches the burning zone. As temperatures increase along the length of the kiln, water is evaporated and complex chemical processes occur at different stages resulting in the raw material being calcined to become clinker (Figure 2.2-3). The clinker is then cooled and sent to either the clinker storage bins or the clinker storage silos for processing. The clinker is processed with 5 percent gypsum and 1 percent mineral components and then conveyed to the finish mills to be ground into portland cement. The cement is then conveyed from each finish mill cooler to storage silos or stock bins. From bulk storage silos, cement is loaded into rail cars for distribution. From the stock bins, the cement is conveyed to packer bins where it is loaded into bags and then the bags are conveyed into rail cars or trucks for distribution (DEQ, 2004a).

Holcim operates a wet process kiln using a combination of coal, syncoal, coke, and natural gas as fuel. The kiln is fired by injection of fuel at the lower end to maintain a combustion zone with very high temperatures. The fuel consumption for the wet process kiln is approximately 5.71 million Btu per ton of clinker produced (Holcim, 2004).

Figure 2.2-2 Typical Wet Process Cement Kiln

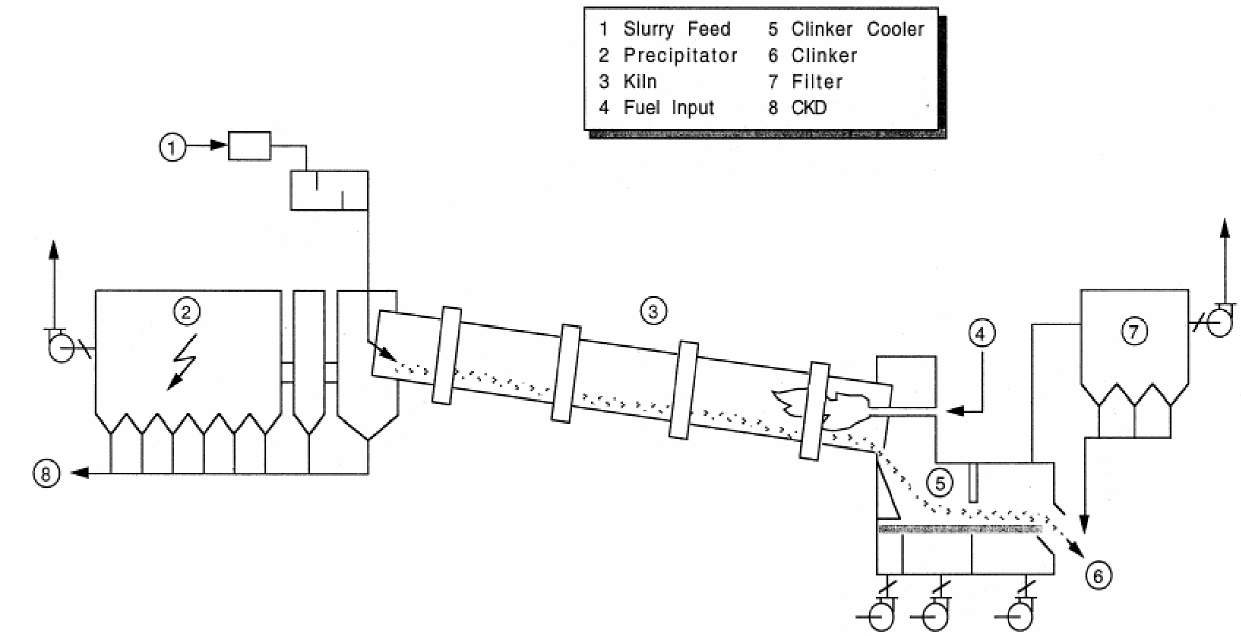


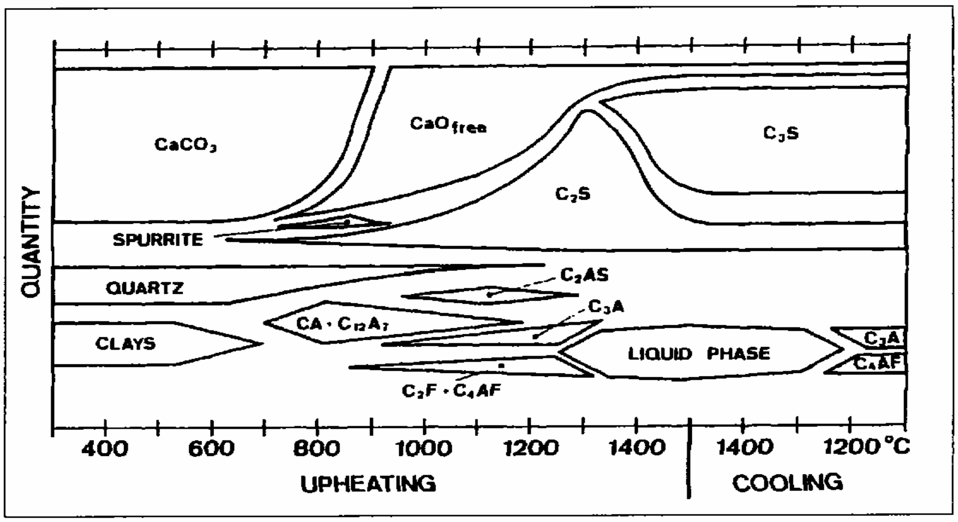
Figure 2.2-3 Analysis of Cement Manufacturing Process

Analysis of Wet vs. Dry Cement Manufacturing Process
Prepared by Holcim
November 1, 2004

There are five stages in manufacturing clinker:

- Drying - >100 C
- Preheating 100 - 850 C
- Calcining 600-900 C
- Sintering 800-1450 C
- Cooling 1450 - 1100 C

In these five processes the following physical and chemical reactions occur:



Kilns are typically classified according to the moisture content of the raw feed. Whether clinker is manufactured in a wet or dry process, the required reactions are the same. The diagram shows the associated reactions.

2.3 Proposed Action

The Holcim Trident facility is located in Gallatin County near the Missouri Headwaters, approximately 5 miles northeast of Three Forks, Montana. The site is located in the NE¼ of Section 9, SE¼ of Section 4, SW¼ of Section 3 and NW¼ of Section 10, Township 2 North, and Range 2 East (Latitude 45° 56” 40.58’, longitude 111° 28” 37.14’). The site is north of Interstate 90, off State Routes 286 and 205.

The site is approximately 1,320 acres of private land. Of this, about 1 to 2 acres in the quarry would be used for tire storage. No additional land outside the existing fenced area would be used. Figure 2.3-1 shows the general layout of the existing Trident plant and the approximate locations of proposed tire-related facilities, including the storage trailers, kiln gate, and proposed conveyance system. Major existing components of the Trident plant are also identified.

Whole tires require special consideration when receiving or storing them on site. Whole tires, due to their shape, can retain up to two gallons of water and are ideal breeding grounds for mosquitoes and rodents. To avoid these potential storage problems, only trailer load shipments of

whole tires would be accepted. Whole tires would not be removed from the on-site trailers except to load them onto a conveyor feed system leading to the kiln. No scrap tires would be dumped or loosely stored on site. The trailers in which the whole tires would be stored would be intact, closed top van trailers.

Tires would be delivered and stored in trailers in the quarry prior to delivery to the kiln. Each trailer would hold about 1,000 tires. The 10 to 15 trailers would be parked in rows and would be spaced at least 50 apart to prevent fire spread. An area about 200 feet wide around the quarry would be kept free of vegetation.

The tires would be unloaded from the trailers into a bin automatically with a trailer lift. A conveyor would feed the tires from the bin to a mechanism that would insert one tire at a time into the kiln, at specified time intervals. A gate would be installed into the mid-kiln shell that would allow tires to be dropped in the calcining zone of the kiln. Holcim has projected that 1,137,539 waste tires could be combusted each year. This equates to a maximum estimate of 94,795 tires, or 950 tons, each month. No more than one week's supply of tires would be stored onsite at one time. Holcim has estimated the cost of facility improvements to combust tires as fuel at $1,000,000 (Holcim, 2004).

The potential for fire is minimal, since tires will not auto-ignite until 1800°F. A fire prevention/fire-fighting plan has been devised in cooperation with the local fire chief and is described in Section 2.3.3. Water for fire suppression would be supplied to the tire storage area with a charged waterline and hydrant or a holding tank at the storage area.

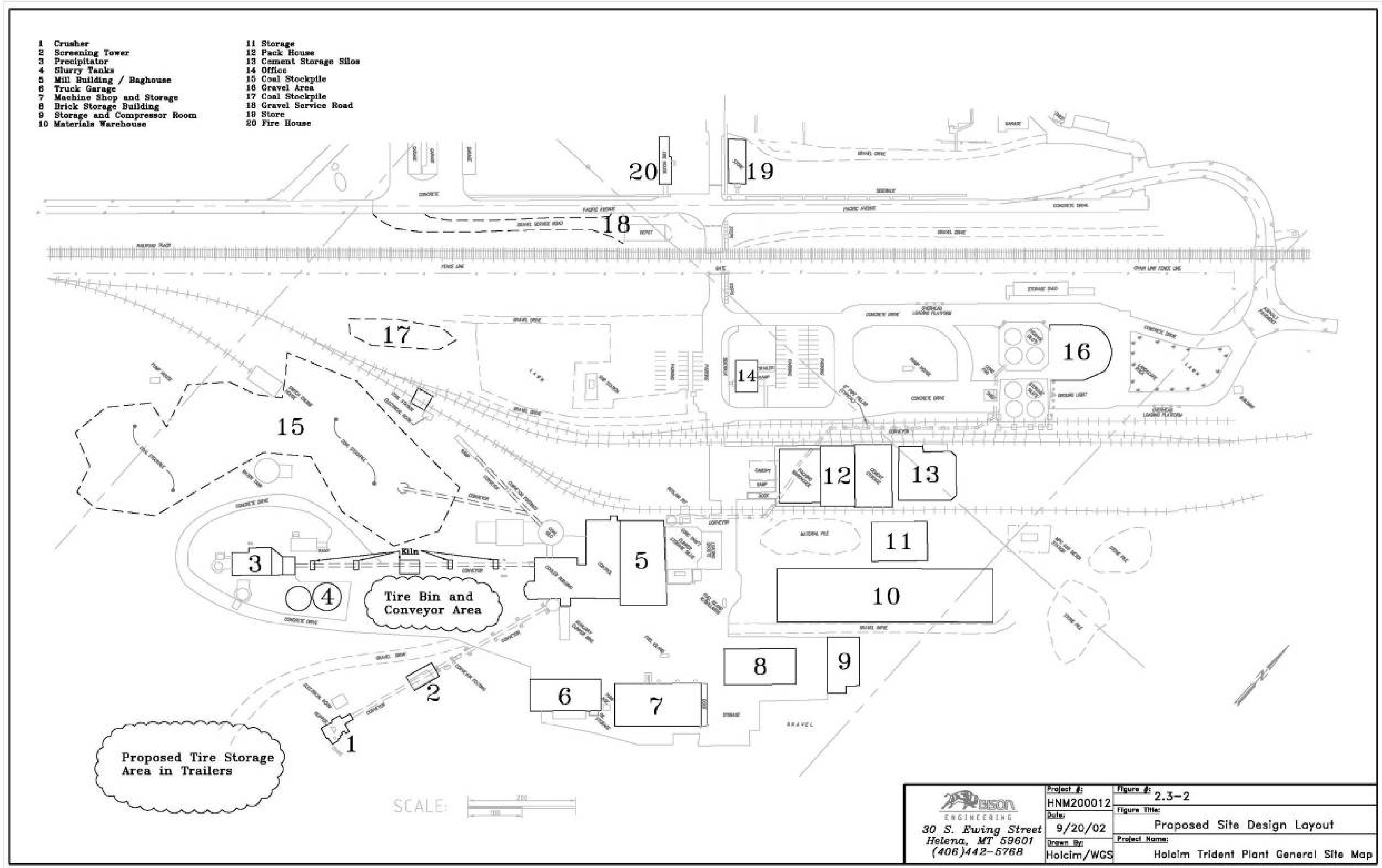


Figure 2.3-1 Holcim Site Layout

2.3.1 Project Facilities

Holcim proposes to substitute whole tires for up to 15 percent of the total heat input, on a Btu basis, provided by the mix of fuels used to fire the kiln. Proposed physical changes involve on-site tire storage and modification of the kiln to allow for the insertion of tires (Holcim, 2004).

The kiln modification would be constructed in accordance with state and federal building codes and standards. Occupational Safety and Health Administration standards would apply to overall operations. Other regulations and design codes would be followed, as applicable. Holcim provided draft design drawings, procurement specifications, and combustion modifications with sufficient information to disclose impacts.

Equipment and systems such as water storage tanks and a storm water detention pond would be located near the kiln and cement block complex. Existing administration offices and the control room, warehouse, and gatehouse would remain unchanged with the Proposed Action.

The equipment associated with the Proposed Action would be small compared to most industrial equipment found at cement manufacturing facilities. The control room, electronics area, and electrical switching equipment would be located in existing buildings.

Project Lands

The tire storage trailers and the conveyor would occupy previously disturbed land.

Roads and Parking Areas

The cement plant access road (approximately 3.9 miles long) is asphalt. Roads around the immediate vicinity of the Trident facility are designed to carry heavy equipment. Other service and maintenance roads within the Trident facility would be surfaced with crushed rock, and would be designed for heavy haul trucks. A 0.5-acre construction parking lot and storage area covered with crushed rock would be provided for construction trailers, tools, vehicles, equipment, and material.

Plant Buildings and Structures

Figure 2.3-1 shows the facility site layout, including plant buildings and structures.
The design of the project is based on receiving tires for the kiln via a conveyor from the quarry. Using conveyors instead of a loader, train or other tire transport, reduces dust from handling and the potential to introduce rocks and other foreign material into the kiln. Conveyor systems are considered good engineering practice methods providing efficiency, reliability, and dust minimization.

Operations and Maintenance

Holcim has stated that it would not likely employ additional people for the initial operations nor would there be an increase in employees during normal operations. DEQ indicated in the revised EA (DEQ 2003) that additional peripheral jobs could be created from the transfer and storage of the waste tires.

The cement kiln would be operated 24 hours per day to provide maximum product output throughout the year. Cement plant operations are currently monitored by a Continuous Emission Monitoring System (CEMS) for NOx, sulfur dioxide (SO_2), and opacity. CEMS for carbon monoxide (CO) would be added before tires would be added to the kiln. The Startup, Shutdown, and Malfunction (SSM) plan describes the operations and maintenance scenarios associated with an SSM sequence. Holcim provided this SSM document (December 2004) at DEQ's request. The SSM plan is required by the Portland Cement Maximum Achievable Control Technology (MACT) rules at 40 CFR 63 Subpart LLL.

Planned maintenance would be coordinated with overhauls to reduce the impact of having units shut down for maintenance.

2.3.2 System Design

The system design consists of a kiln gate, conveyor and associated peripheral systems, tire storage areas, and material handling. Approximate locations are shown in Figure 2.3-1.

Kiln Gate, Conveyor and Associated Systems

Tires would be delivered by rail or truck (DEQ, 2001). Incoming enclosed trailers of tires would be weighed at the plant scales (shipping silos). Should tires arrive through rail transport, it is uncertain how the tires would be weighed on the rail car. The purchasing agreements and shipping logistics have not been decided pending DEQ's permitting decision. Trailers would be driven through the plant to the quarry floor, and rail cars would use the spur line. The offloading and placement of the trailers have not been designed at this time. Tires would be stored in enclosed trailers.

Trailers would deliver the whole tires to the bin. Tires would be fed from the bin to a conveyor one at a time via a standard tire feed arrangement common to most whole tire burning kilns. They would be sorted to meet size specifications; it is uncertain how the facility would deal with this issue. The conveyors would then deliver whole tires to the kiln.

Air Emission Control Equipment and Facilities

The air emissions control equipment and kiln operations would not change with the proposed combustion of whole tires as fuel.

The ash particulates generated during the combustion process would be removed by an existing electrostatic precipitator (ESP) and fabric filter (FF), or "baghouse", system. Ash from the baghouse would accumulate in separate hoppers and would be carried by truck to the disposal area in the quarry or would be reused in the cement making process. An induced draft fan would move the flue gas through the kiln and create a negative pressure ensuring fugitive emissions do not occur at the tire injection point.

Storm Water and Monitoring Plans

The Holcim cement facility does not have a Storm Water Pollution Prevention Plan. All storm water discharges would need to meet the requirements of the facility's storm water Montana Pollutant Discharge Elimination System permit (DEQ, 2004). A monitoring plan has been

issued through DEQ's Environmental Management Bureau, and ground water monitoring systems for the quarry currently exist. These systems are required for the life of the facility. No additions to the monitoring system have been suggested or would be added because of the Proposed Action.

Solid Waste Disposal

Solid waste would consist primarily of fly ash from the ESP. Fly ash would consist of incombustible coal material entrained in the flue gas exhaust. Fly ash would be collected in the ESP and trucked to the on-site quarry.

2.3.3 Material Handling

Tire Handling System

A description of the tire handling facility was provided by Holcim (Feb. 11, 2004), based upon similar Holcim facilities. Figure 2.3-1 shows the approximate locations of the equipment and storage area. A single conveyor belt would deliver tires from the bins to the feeder system. A day's supply of tires would be as large as 31 tons, assuming injection of 3,117 tires per day at 20 to 25 pounds per tire. The feeder system would be about 12 feet high and cover about 2500 square feet.

Fire Safety Plan

Tire fires generate air pollutants and have the potential to produce oils as a fire progresses and some of the tires melt. The amount and type of air pollutants produced depend on the fire conditions. In general, as the burn rate and temperature of the fire increases, the amount of organic pollutants decreases. Some potentially harmful air pollutants that could be emitted include benzene, toluene, xylene, and a variety of polycyclic aromatic hydrocarbons. A standard car tire could produce approximately two gallons of oil. This oil would have to be contained to prevent runoff and possible pollution of surface water or groundwater.

The floor of the quarry would be sloped to a bermed area that would be large enough to contain the oil from melted tires as well as the fire fighting liquids. If there were a fire, the resulting liquids could be separated and treated or disposed of as appropriate.

Since the Holcim plant operates 24 hours per day, seven days per week, the tire storage area would be monitored during each work shift. Because tire fires are increasingly difficult to extinguish as time passes, Holcim personnel would be the first responders to any fire at the tire storage area. They would work to extinguish or contain the fire until the local volunteer fire department arrived. A tire fire would be fought according to a time sensitive plan.

During the initial stage of the fire, 0 to 15 minutes, individual tires would be burning, but the fire would not have extended to the rest of the tires in the trailer. At this time, the fire may be extinguished with water, foam, or wetting agents. Equipment would be used to remove burning tires if possible. Single or small groups of burning tires are relatively easily extinguished with sprayed water or foam or submersion in water. Equipment operators would be contacted to move other trailers away from the burning trailer, and the local volunteer fire department would be contacted.

During the next period, 15 to 30 minutes into the fire, the flame spread would be approximately 2 square feet every 5 minutes. Extinguishing the fire would become increasingly difficult. Plant personnel and/or fire fighters would continue to use water mist and foam to attempt to limit or remove oxygen from the fire and to cool the burning tires. Focus would continue to be on removing other trailers from the area. Workers would continue to attempt to remove burning tires from the mass. Other workers would begin to build an earthen berm around the burning tires separated from the main mass. Material for the berm would come from material stockpiled on the quarry floor. Fire fighters would apply foam to oil runoff streams and any other trailers that might be in danger of catching fire. At this point, soil might be brought in to be pushed over the burning mass. The need for plant evacuation would be carefully evaluated.

After 60 minutes of burning, the fuel consumption and heat production would begin to equalize. Combustion would become more efficient and produce enough heat to consume most combustible material. The downward pressure of the burning tire mass would tend to cause added runoff and increase the production of oil. A clay–like ash crust would be forming on the burning mass, preventing water from penetrating. At this stage, workers would finish removing trailers that are not involved in the fire. Berms would be bulldozed around the burning trailers to further contain runoff. If the fire were not extinguished by this time, the burning trailers would be allowed to continue to burn completely, so they could be buried at a later time. Removal, separation, treatment, and disposal of the runoff could begin.

If necessary, evacuation of plant personnel would follow Holcim's "Emergency Action Plan." Any public evacuation necessary in the area would be directed by the Gallatin County Sheriff's Department.

In the event of a fire, plant personnel would be familiar with the fire contact list which would include the Three Forks Volunteer Fire Department, Three Forks Police Department, Gallatin County Sheriff's Office; the Holcim plant manager, control room operator, safety manager, quarry manager, and environmental manager; Roadermel Construction for earth moving equipment, and Emerald Services for oil removal; DEQ's emergency response duty officer, Gallatin County Health Department, and Gallatin County Disaster and Emergency Services duty officer.

2.3.4 Construction

Project Schedule

DEQ expects that the construction schedule, from the start of contractor mobilization on site and preparatory foundation work, including startup, would take about six months. The exact time frame would depend upon the level of automation to be designed and the proposed tire feed rate. The installation of the kiln hardware depends on the normal annual kiln maintenance shut down period, and would be completed within a two-week period. All other construction is presumed to be contingent upon equipment purchases and design completion.

Construction Activities

The installation of the foundations and structures would be required for new equipment. Foundation construction would consist of excavation, form erection, reinforcement installation, concrete placement, and backfilling. During this stage, underground piping and electrical conduit would be installed between the building foundations. Major construction equipment used during this stage would consist of medium-sized mobile cranes, backhoes, dump trucks, concrete pumps, and concrete delivery trucks. Heavy material and equipment deliveries can be made by truck or railroad car during the next phase.

Structural steel erection would begin when foundations are sufficiently complete. Large cranes would be used to unload the steel members and raise them to their final location.

Other major equipment would begin arriving at the Trident facility for erection during the next construction phase, including storage bins, kiln gate, and conveyors.

Major equipment would be placed and interconnected mechanically and electrically during the next stage. Major construction equipment used during this stage would consist of medium-sized mobile cranes, flatbed trucks, welding machines, portable power generators and air compressors, and cable pulling equipment.

Access Road Construction

The cement plant site has many existing trails, roads and rail lines near the facility. Spur road construction and existing road and rail network upgrades would need to occur in order to allow access of covered trailers and equipment into the proposed storage site. This may involve re-grading. Equipment to construct the access roads would include hand tools, bulldozers, graders, and crew-haul vehicles. The road construction would probably be done by Holcim employees. Standard design techniques such as installing water bars and dips to control erosion should be included. In addition, measures should be taken to minimize rainwater ponding in low lying locations.

2.3.5 Mitigation Measures

DEQ cannot require mitigation measures without a request from the project proponent, unless they are regulatory requirements to ensure compliance with a permit (75-1-201(5)(b), MCA). Mitigation measures are discussed in section 4.11. Holcim may request that any or all of the mitigation measures be placed in the solid waste or air quality permits. If Holcim chooses not to include a mitigation measure in one of the permits, it may decide to perform the proposed mitigation voluntarily.

2.4 Alternatives Considered and Eliminated

DEQ has identified several alternatives to the project. Alternative fuels, production process, pollution control technologies, storage sites, and reduction in the percentage of tires to be used were considered. The alternatives described in this section were eliminated from further consideration because they did not meet the stated purpose and benefits of the Proposed Action or were found to be unreasonable for detailed analysis based on selection criteria. The screening criteria consisted of technical, logistic, economic, and regulatory considerations, potential

resource impacts, and reasonable/feasible criteria. A summary of the alternatives considered and eliminated is provided in Table 2.4-1.

2.4.1 Fuels

Alternative fuels include synthetic fuels (shale oil or tar sands), methane, biomass such as refuse derived fuel (RDF) and municipal solid waste (MSW), and processed tires (chunk, shredded, or crumb rubber, with or without the steel removed). They have all been successfully used as fuels in cement manufacturing, steam generation for electricity, and other industrial processes (EPA, 1997) but would not be feasible as the primary fuel for the Trident plant.

Tar sands, methane, RDF, MSW, and processed tires do not all compare favorably to coal. Whole and processed tires are the only fuels that have higher heating values and less moisture content than coal. Whole and processed tires contain more carbon, about as much sulfur as medium-sulfur coal, but much less fuel-bound nitrogen.

The logistics associated with tar sands, methane, and biomass fuels are restrictive, as no transportation systems are currently in place or would be available in the near future. While transportation of any of these fuel types would add to fuel costs, no studies have been completed to quantify these transportation costs.

The EPA has stated that using anything other than coal reduces air impacts. Whole tires also provide some added ingredients to the cement manufacturing process. Replacing whole tires with processed tires would require segregating, processing, chipping, and storing various tires and parts of tires. Processed tires would require complex burner management systems and would create additional waste streams. Therefore, processed tires as a fuel alternative was considered unreasonable economically and not feasible to meet the purpose and benefits of the project and therefore eliminated from further consideration.

All other alternative fuels considered here were eliminated from further consideration because they are not feasible due to a lack of production capacity, higher production and transportation costs, logistics, and required facility modifications. They also would not meet the purpose and benefits of the Proposed Action.

2.4.2 Conversion from Wet to Dry Kiln

Conversion of the kiln from a wet process to a dry process was considered. Holcim's Trident facility uses a wet kiln design. Many cement plants in the United States and other countries use the dry process because of its lower energy requirements (AWMA, 1992).

The essential difference between a wet process cement kiln and a dry process preheater cement kiln is the medium used to mix the powdered raw materials prior to heating and the consequent degree of moisture in the materials entering the kiln. In the wet method, water is added to the raw materials during milling to promote thorough mixing, and the mixture is added to the kiln as slurry containing 30 to 40 percent water. In the dry method, the powders are generally blended in a silo using compressed air.

If the material entering the kiln is wet, it stays cooler relatively longer. This in turn requires a longer kiln to provide sufficient residence time. Additional fuel is needed to drive off the water. One reason to choose the wet process is if the starting materials have high moisture content to begin with. The wet process was the dominant technology, presumably because, in the age of abundant cheap energy, it was cheaper to burn more fuel and add length to the kiln than to add extra devices. An advantage of wet kilns over dry kilns is that the feed is blended more uniformly and dust losses are smaller (Portland Cement Association, 2004).

Newer kilns use the dry method. There is a substantial energy saving involved, as well as a higher production rate. Several subtypes of the dry method have evolved in recent years. In the earlier versions, the kilns were shortened to take advantage of the shorter residence time required. Since hot air emerged from the upper end of the kiln at a higher temperature than with the wet method, it became advantageous to capture the heat and use it to run utility boilers to generate electricity, resulting in a cost savings for the plant as a whole. Alternatively, the kiln could be lengthened, and heat exchangers could be added to the upper end to retain more of the flame's heat inside the process area. This would increase the heat transfer efficiency.
The advantages of the dry process became more apparent with the addition of pretreatment equipment to condition the powdered raw materials before their introduction to the kiln. One pretreatment method uses suspension "preheaters" to transfer heat from the kiln exhaust gases to the incoming material, which both improves heat transfer and promotes good mixing. Another kind of pretreatment equipment, called a "precalciner", pumps even more heat into the pretreatment phase, often combining some additional fuel with preheated air from the clinker cooling stage. The precalciner system is the most energy efficient arrangement with the highest production rate and the shortest kiln. It is slowly replacing earlier technologies. These alternatives were eliminated as they are connected with the dry process kiln and are not compatible with the present wet kiln process. Holcim has stated that the primary purpose in seeking approval for combustion of whole tires to supplement 15 percent of the required fuel input for the kiln is to realize lower operating costs and to increase operational flexibility (Holcim, 2004).

A wet process kiln uses considerably more energy to remove water from the slurry compared to a dry-process kiln where raw materials are fed into the kiln as crushed solids. Average energy use in a wet-process kiln is 4.5 million Btu per ton of clinker produced. Average energy use in a dry-process kiln is 3.5 to 4.0 million Btu per ton of clinker produced but can be lower if a suspension preheater and precalciner are used (2.9 to 3.4 million Btu/ton). Holcim reports its current energy use is 5.71 million Btu/ton of clinker (Holcim, 2004).

In addition to reductions in energy consumption with a dry kiln, the dry process also has lower NO_x, SO_2, particulates, and carbon dioxide (CO_2) emissions.

Conversion of the wet process kiln at Trident to a dry process kiln would be expensive. Holcim's Devil's Slide plant in Utah was converted in 1998 at a cost of $133 million. Using a producer price index of 10 percent to convert to 2004 dollars, conversion of the Trident kiln would cost about $146 million.

The modification to a dry kiln was not considered reasonable due to the increased costs associated with the major capital equipment requirements. This alternative was eliminated because it would not meet the stated purpose and benefits of the project.

2.4.3 Off-Site Tire Storage

An off-site tire storage facility was considered and eliminated.

Alternative locations for tire storage were viewed as logistically not suitable to the purpose and benefits of the project. Alternative sites are not close enough to major transportation routes (i.e., both interstate highways and railroad systems) to allow for the transitional storage, transport and receipt of tires. Tire transportation from off-site storage would be more expensive.

Other locations that were adjacent to the plant were considered, evaluated and eliminated as potential tire storage sites; these sites were not accessible or close to the kiln, unavailable for purchase, and did not have adequate topography and drainage. The economics of the project are based on the availability of an abundant supply of tires on-site in the immediate vicinity of the kiln.

The proposed tire storage site location in the quarry is the best available option from both an environmental and an economic standpoint.

The off-site tire storage facility alternative was eliminated because it was not logistically reasonable or economically feasible to meet the needs as a fuel supply for the facility.

2.4.4 Reduction in Percentage of Tires Used

In a recent tire burning emissions report by the California Air Resources Board to the California Legislature, it was found that in 2001, the State of California permitted 11 facilities to burn tires (CARB, 2002). Only four of these facilities burned tires. The tires were burned as supplemental fuel, usually 10 percent tire to 90 percent coal. About 5.4 million tires were burned in this manner in 2001. In general, tires and coal emit the same levels of criteria pollutants when burned, except for nitrogen oxides. Toxic air pollutants included acetaldehyde, benzene, dioxins, formaldehyde, furans, hexavalent chromium, other heavy metals, and PAHs. The CARB report concluded that the levels of toxics emitted for units burning the 10 percent tire and 90 percent coal fuel mixture did not constitute a significant increase in the health risk to the exposed public (CARB, 2002). Reduction in the use of waste tires to 10 percent of supplemental fuel also reduces nitrogen oxides.

The proposed reduction of tire usage was eliminated because the recent risk assessment concluded that the levels of toxics associated with the proposed action did not exceed Montana's negligible risk level. Therefore, this alternative was eliminated for economic reasons, as it would not meet the purpose and benefits of reducing fuel costs for the facility.

Table 2.4-1 Screening Criteria of Alternatives Considered and Eliminated

	Alternative Fuels						
Screening Criteria	**Synthetic Fuels (e.g., shale oil, tar sands, etc.)**	**Coal Bed Methane**	**Biomass**	**Processed Tires**	**Dry Process Kiln**	**10% Tire Use as Fuel**	**Off-Site Tire Storage**
Technical	Technically feasible, but would not be feasible under current design. Insufficient fuel for proposed load.	Technically feasible, but would not be feasible under current design. Source not readily available.	Technically feasible, however no RDF or MSW feasible under current design and for this type of facility. Design is totally different and tied to biomass supplies.	Technically feasible.	Processes would require re-design. Major Modifications would be needed. Efficiency would increase.	10% would require less storage area.	Technically feasible.
Logistics	There are no conveyances available for fuel supply.	A conveyance would have to be built to the nearest commercial transportation pipeline.	There are no conveyances available for fuel supply.	Would require completely new facility modification and design and handling logistics to burn TDF.	Would require completely new facility design. This system would burn less fuel for same BTU output.	Similar to the Proposed Action.	Requires a new assessment of access roads and accessible land.
Economics	Economics of the facility would rely upon an abundant supply of fuel in the immediate vicinity, of which there are none.	Economics of the facility would rely upon an abundant supply of fuel in the immediate vicinity, of which there are none.	Economics of the fuel types are infeasible and cost prohibitive.	No cost analyses were performed for this type of design change.	Conversion would cost about $146 million.	Would not be as cost efficient as the Proposed Action in reducing fuel costs at the facility.	Assume costs are similar or somewhat higher because of additional logistics to coordinate tire solid waste storage.

Regulatory Considerations	No expected changes in regulation except that new emission rates would have to be calculated and modeled.	No expected changes in regulation except that new emission rates would have to be calculated and modeled.	No expected changes in regulation except that new emission rates would have to be calculated and modeled.	No expected changes in regulation except that new emission rates would have to be calculated and modeled.	No expected changes in regulation except that new emission rates would have to be calculated and modeled.	New emission rates would have to be calculated and modeled.	Solid waste permit would need to be modified to accommodate logistics and handling of whole tires on a new site as well as a closure plan.
Potential Resource Impacts	Air impacts would be new and could affect SO_2.	Air impacts would be minimized due to gaseous fuels.	Air impacts would be minimized and new impacts would be associated with RDF and MSW.	Similar to Proposed Action after air quality mitigation.	Air emissions would be similar to Proposed Action.	Similar impacts to using 15% tires as fuels.	Could aggravate exposure to groundwater impacts as this may be different than the quarry.
Reasonable/ Feasible	Not economically feasible because of deliverability and would not meet the stated purpose and benefits for the Proposed Action.	Not economically feasible because of deliverability and would not meet the stated purpose and benefits for the Proposed Action.	Not reasonable because of fuel transportation costs and increased cost of logistics, and would not meet the stated purpose and benefits for the Proposed Action.	Not reasonable because increased costs and additional waste streams would make the project infeasible, thus not meeting the stated purpose and benefits for the Proposed Action.	Not reasonable because increased costs would make the project infeasible, thus not meeting the stated purpose and benefits for the Proposed Action.	Similar to the Proposed Action.	Not logistically reasonable or economically feasible to meet the needs as a fuel supply for the facility.

2.5 Alternatives to the Proposed Action

2.5.1 No Action Alternative

Under the No Action Alternative, the tire storage facility and the conveyor system to the kiln would not be constructed. DEQ would not issue the Solid Waste License and would not modify Permit #0982. Existing operations would continue as described in Section 2.2.

2.6 Comparison of Alternatives

The only alternative to the Proposed Action that has been compared is the No Action Alternative described above. Table 2.6-1 presents a summary comparison of the impacts. Further details of the impacts are presented in Chapter 4.

2.7 Selected Alternative

The rules implementing MEPA (ARM 17.4.617) require that DEQ indicate a preferred alternative, if one has been identified. Stating a preference at this time is not a final decision. The preferred alternative could change in response to public comment on the Draft EIS, new information that becomes available, or new analysis that might be needed in preparing the Final EIS. At this time, DEQ does not have a preferred alternative. DEQ has tentatively selected the Proposed Action, which would be modified by permit conditions.

2.7.1 Rationale

Holcim has demonstrated compliance with all applicable statutes and rules , as required for permit issuance. Conditions and limitations contained in the permit (Appendix C) would ensure the facility could operate in compliance with all applicable rules and regulations. Slag use would be limited to no more than 15,000 metric tons (16,535 tons) in a rolling 12-month time period, and DEQ would encourage Holcim to find other sources of iron.

Therefore, the No Action Alternative would not be appropriate and would not provide the cost savings that is the goal of the Proposed Action.

Table 2.6-1 Summary of Impacts

	Proposed Action	No Action
Air Quality	Some HAPs emissions from the kiln, such as mercury, would increase, some would decrease, and others would remain about the same.	No change from existing emissions.
	Most kiln dust HAPs emissions would decrease.	No change from existing emissions.
	Criteria pollutants would remain about the same, except that CO would increase but would still comply with MAAQS and NAAQS.	No change from existing emissions.
	Peak 1-hour dispersion coefficients (ratio between ambient concentration and emission rate) would decrease by a factor of 100 from the plant property boundary to Bozeman. Annual average dispersion coefficients would decrease by the same factor.	Same as the Proposed Action.
Human Health Risk	Non-cancer hazard quotients and indices would be less than 1.0.	Same as the Proposed Action.
	Blood lead levels at the worst-case location would be 12 percent of EPA's recommended limit.	Same as the Proposed Action.
	Cancer risk for individual pollutants at the worst-case location (plant property boundary) would not exceed 1 x 10^{-6} under the average exposure scenario. Cancer risk for individual pollutants and the aggregate of all pollutants would not exceed Montana's negligible risk level for communities in the Three Forks to Bozeman area under the average and high-end exposure scenarios.	Same as the Proposed Action.
	Cancer risk from eating 74 pounds per year of fish caught locally from rivers (high-end exposure scenario) would be below 1 x 10^{-6}.	Essentially the same as the Proposed Action.
	Cancer risk from eating a substantial amount of fish caught from local ponds over a lifetime could result in risk of greater than 1 x $10^{-6}$for individual pollutants (principally dioxin and PCBs), depending o the location, configuration, and hydrologic properties of the pond.	Essentially the same as the Proposed Action.
	Cancer risk from eating, over a lifetime, as much as 126 pounds per year of deer killed in the area would be below 1 x 10^{-6}.	Essentially the same as the Proposed Action.
Ecological Risk	Hazard index for carnivorous birds (e.g., red-tailed hawk) would be as high as 7 at the worst-case location, and the hazard index for avian omnivore (e.g., robin) would be as high as 1, depending on input assumptions. Hazard index at the worst-case location for all other plant and animal groups would be less than 1. For the area surrounding the facility, hazard indices for all species are below 1, indicating no hazard to the broader ecosystem.	Same as Proposed Action except robin would be 1.0.
Transportation	Daily truck trips would increase by 3.6 per day (1,300 per year), about 0.5% of current traffic level.	No additional truck traffic.
Property Taxes	An additional $10,720 for Gallatin County and $3,480 for the state.	No change in property tax revenue.

CHAPTER 3
AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the existing environmental conditions that could be affected by the Proposed Action or alternatives to the Proposed Action. The Proposed Action is described in detail in Chapter 2, and Figure 1.1-1 provides a project location map. This chapter will describe the environmental conditions of the project area relative to natural, social, and cultural resources. The descriptions of the affected environment provide a basis to evaluate potential impacts of the Proposed Action and the No Action Alternative in Chapter 4. The methods and study areas used to inventory existing environmental conditions varied among the resources and are summarized in each resource section. Specific resources evaluated in this chapter include:

- Air Quality
- Soils
- Water Quality
- Wildlife
- Vegetation and Wetlands
- Fisheries and Aquatics
- Land Use
- Transportation and Public Services
- Cultural Resources
- Socioeconomics

3.2 Air Quality

The air quality inventory establishes the baseline conditions by which several important issues identified during the scoping process will be analyzed. For example, risks to human health and to the environment are determined by the way certain incremental or cumulative emission constituents would be transported away from the plant during operations. These impacts and risks are identified in Chapter 4.

The emission of air pollutants is regulated under both federal and Montana state laws and administrative rules. The federal Clean Air Act (CAA) and the subsequent Clean Air Act Amendments of 1990 (CAAA) require the EPA to identify National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. The CAA and CAAA established NAAQS for six pollutants known as “criteria” pollutants. Primary NAAQS and Montana Ambient Air Quality standards (MAAQS) are established at a level designed to protect public health with an adequate margin of safety. Secondary NAAQS have also been established, “based on criteria requisite to protect the public welfare from any known or anticipated adverse effects associated with the presence of [the] pollutant in the ambient air" (EPA).
In addition to the MAAQS and NAAQS, EPA has provided an additional level of air quality protection under the regulations of the Prevention of Significant Deterioration (PSD) program.

The PSD regulations contain "PSD Increments," which are maximum allowable increases above the baseline ambient concentration. The PSD Increments are 20-40 percent of the NAAQS for the specific pollutant and averaging period. Areas of the state that are subject to the PSD program are described in Section 3.2.2.6.

Section 3.2.2.1 describes the local meteorological conditions in the Trident area and the greater Gallatin Valley. Types and general sources of regulated air pollutants are described in Section 3.2.2.2. Ambient air quality standards, ambient air quality monitoring data, and other local pollution sources are described in Sections 3.2.2.3 and 3.2.2.4. Section 3.2.2.5 discusses air pollutant emissions from portland cement plants in general, and Holcim's Trident plant in particular. Regulatory requirements specific to the Trident facility are discussed in Section 3.2.2.6, and Section 3.2.2.7 summarizes the recent compliance history of the Trident facility.

3.2.1 Inventory Methods

Temperature and precipitation data for the study area were obtained from the Western Regional Climate Center (WRCC). These data include mean temperature and precipitation levels by month from 1971 through 2000. This 30-year period is the current standard for identifying long-term average temperature and precipitation levels in the United States.

Wind speed and direction in the Trident area were determined by data collected at the Holcim site between April 1, 2000 and March 31, 2001, and from DEQ's monitoring data. The Trident meteorological monitoring site was installed by Holcim to collect data for air dispersion modeling. The station measured hourly average wind speed, wind direction, and ambient air temperature.
Wind conditions in the Gallatin Valley were determined from data collected by the National Oceanic and Atmospheric Administration (NOAA) and Federal Aviation Administration (FAA) Automated Surface Observing System (ASOS) station located at the Bozeman-Belgrade airport. ASOS data from April 1, 2000 through March 31, 2001 have been included to allow direct comparison with the Trident wind data collected by Holcim.

Data from monitoring particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) from Bozeman and Belgrade for the past ten years have been included in this chapter for background information. The data were collected by DEQ and are posted on EPA's ambient air monitoring data website.

3.2.2 Inventory Results

Local Meteorology

Meteorological data are provided for both the Trident area and the Gallatin Valley, which lies southeast of Trident. The Gallatin Valley is home to agricultural production and urban populations. Data from the Bozeman-Belgrade airport are used to represent the meteorological conditions of the Gallatin Valley. Temperature, precipitation, wind speed, and wind direction data are available for both Trident and Belgrade.

Local topographic variations impact the meteorology and climatic conditions at Trident and Belgrade. Trident lies along the Missouri River, in a valley formed by the river bluffs to the west

and the Horseshoe Hills to the east. The bluffs are roughly 400 feet higher than the river valley and strongly influence the wind patterns along the Missouri River valley.

Belgrade is approximately 20 miles southeast of Trident, near the center of the Gallatin Valley. The Gallatin Valley is aligned southeast to northwest, and is approximately 12 miles wide and 20 miles long. Wind directions in the Gallatin Valley are dominated by prevailing southeasterly winds from the high elevations of the Gallatin Range.

Wind Speed and Direction

The Trident meteorological station was located on the Holcim property 1,228 feet (374 meters) southwest of the kiln stack. The purpose of the monitoring station was to provide data for kiln stack modeling; therefore, meteorological sensors were located at the same elevation as the kiln exhaust. Elevation at the Holcim meteorological station was 4,132 feet above mean sea level (ft msl), and the height of the meteorological tower was 33 feet (10 meters) above the ground. Elevation of the wind speed and wind direction sensors was 4,165 ft msl. Elevation at the kiln stack base is 4,035 ft msl, and the kiln stack height is 130 feet, resulting in a kiln stack exhaust elevation of 4,165 ft msl (Holcim, 2004).

Bluffs along the west bank of the Missouri River across from the Holcim facility rise to elevations of nearly 4,500 ft msl. The hills east and southeast of the facility are also 4,500 ft msl or higher. Wind patterns recorded at Holcim's meteorological station show the influences of this confining terrain, causing the wind to follow the Missouri River in a southwest-northeast orientation. Figure 3.2-1 contains a wind rose showing the monitored wind patterns at the Holcim site. The wind rose shows the frequency of winds from each of 16 cardinal directions (north, north-northeast, northeast, etc.). The length of each 'petal' indicates the frequency of winds blowing from that direction. As described in the legend, the bands in the petals indicate the frequency of the listed wind speeds.

The wind rose for the Holcim site shows a strong southwest-northeast orientation of the wind pattern, as would be expected due to the topography of the monitoring site. As shown in the figure, about 25 percent of the hourly average wind directions were from the southwest and about 13 percent of the hourly average wind directions were from the north-northeast. The strongest (highest velocity) winds were from the north-northeast, as shown by the relatively large dark section at the end of the north-northeast petal of the wind rose. The dark sections indicate wind speeds greater than 10.8 meters per second (m/s) or 24 miles per hour (mph).

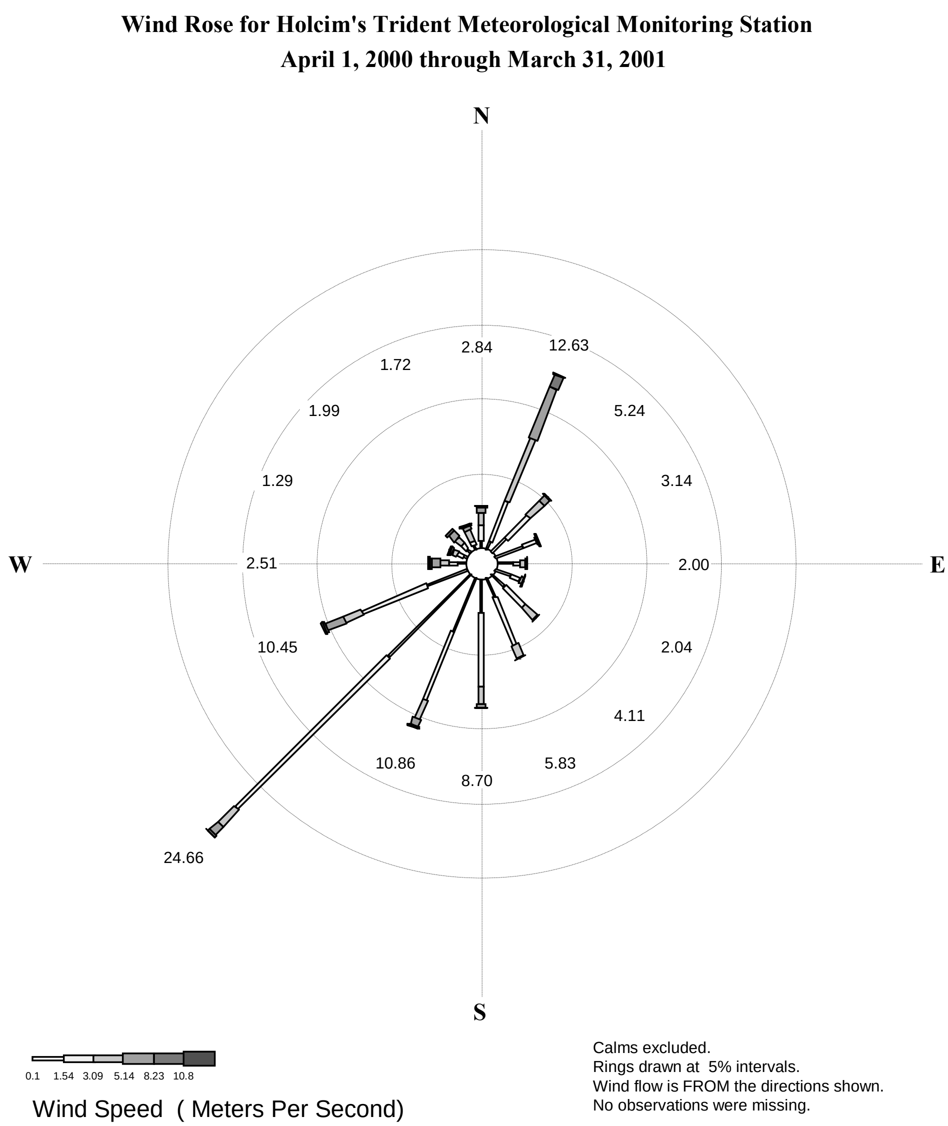


Figure 3.2-1 Wind Rose for Holcim's Trident Meteorological Monitoring Station

Wind conditions in the Gallatin Valley are represented by data collected by the NOAA/FAA ASOS station located at the Bozeman-Belgrade airport. ASOS is an automated observing system being sponsored by the FAA, NOAA, and the Department of Defense. ASOS provides weather observations including: temperature, dew point, wind speed and direction, altimeter setting, visibility, sky condition, and precipitation. Automated observing systems are designed to

provide pilots and other users with airport weather observations, when they are needed. The site identification number for the Belgrade airport ASOS station is WBAN #24132 and the call sign for the site is BZN (WRCC).

Elevation of the ASOS station site is 4,427 ft msl and the meteorological tower is 33 ft, making the elevation of the wind speed and direction sensors 4,460 ft msl. Topography surrounding the Bozeman-Belgrade airport is generally flat, sloping gently toward the Horseshoe Hills to the north. The foothills of the Gallatin Range lie 14 miles southeast of Belgrade, and the north-south trending Bridger Mountains are located about 8 miles east of Belgrade.

Figure 3.2-2 is a wind rose showing the monitored wind patterns at the Bozeman-Belgrade Airport ASOS station during the period corresponding to the Holcim monitoring at Trident. The dominant wind pattern is from the southeast, indicating prevalent winds from the high elevations of the Gallatin Range. As shown in the figure, about 12 percent of the hourly wind direction readings were from the southeast and about 12 percent were from the south-southeast. The strongest (highest velocity) winds were from the west and northwest, as indicated by the dark sections at the ends of those petals of the wind rose.

Data reported on the WRCC website for the BZN ASOS station are based on unedited surface data designed to provide information primarily for aircraft. Data from the ASOS station would not be suitable for computer simulated air dispersion modeling due to the unreliability of automated cloud cover observations and an unrepresentative number of calm wind hours reported. Hourly wind speed and direction readings are based on a 2-minute average just prior to the observation time. The ASOS station makes additional readings between the scheduled hourly readings, as needed, to indicate changes in weather conditions. The wind speed is reported in knots, and the wind direction is reported to the nearest 10 degrees. If the wind direction varies by 60 degrees or more during the 2-minute evaluation period, it is reported as variable (VRB). The variable readings were replaced with the average of the readings before and after the variable reading and only the scheduled hourly readings were used for developing the wind rose.

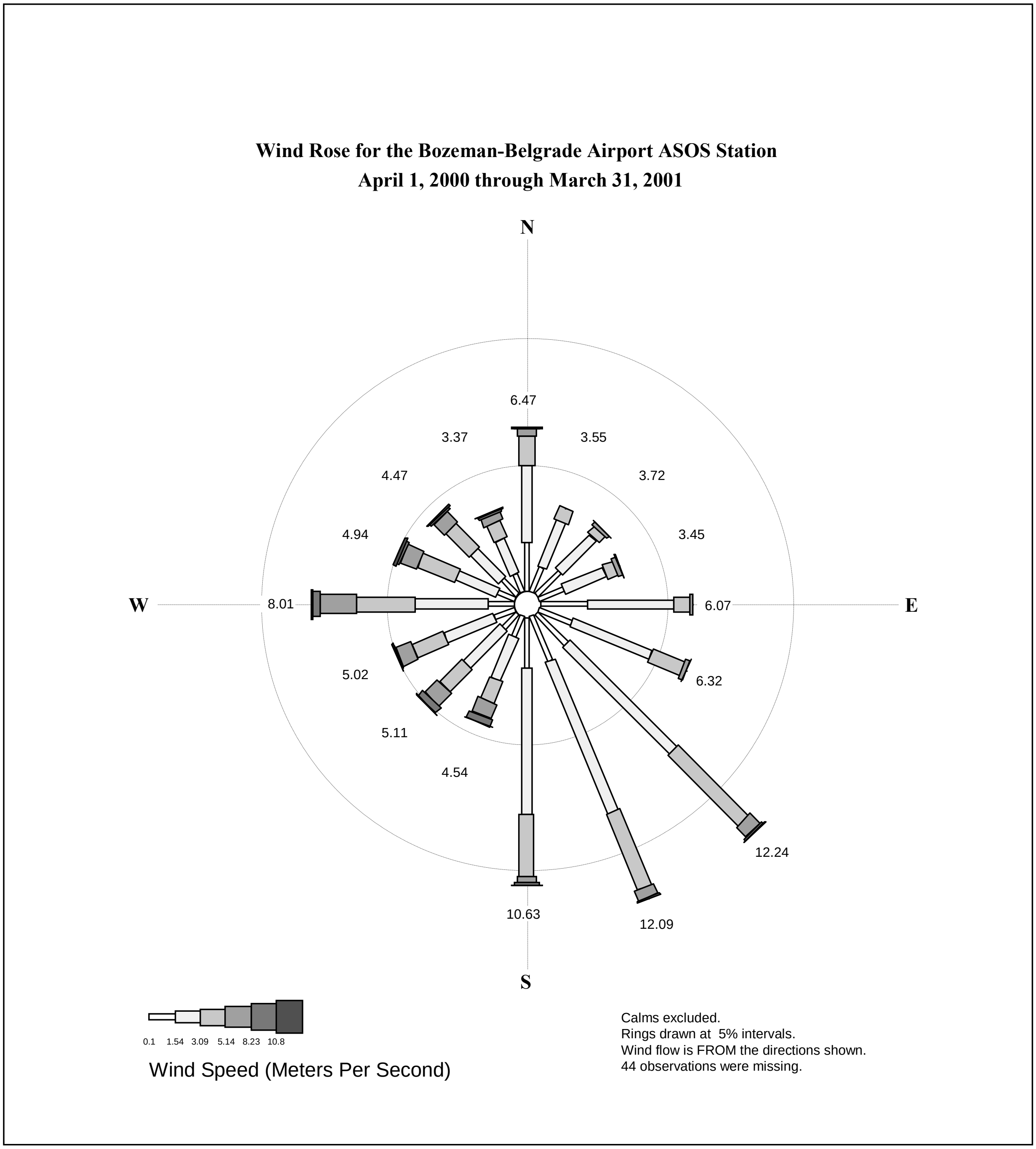


Figure 3.2-2 Wind Rose for the Bozeman-Belgrade Airport ASOS Station

Temperature and Precipitation

The NOAA Cooperative Observer Network has had observers located at both Trident and Belgrade since 1948. The observers record daily temperature and precipitation, which are used by National Climatic Data Center (NCDC) to develop monthly normals. The most recent period of record spans the years from 1971 through 2000.

The data in Tables 3.2-1 and 3.2-2 show that temperatures are generally lower at the Belgrade airport than at the Trident observation site. The mean daily temperature recorded at Trident during the period of record varied from a maximum of 68.5 degrees Fahrenheit (°F) in July, to a minimum of 22.9°F in January. The mean daily temperature recorded at Belgrade during the same period varied from a maximum of 65.3°F in July, to a minimum of 18.6°F in January. Annual precipitation for the period of record is almost two inches more at Belgrade than at Trident. Mean annual precipitation for the 30-year period of record was 12.85 inches at Trident and 14.71 inches at Belgrade. The heaviest precipitation amounts at both sites occurred in the months of May and June.

Table 3.2-1 Trident, Montana Temperature & Precipitation Summary/Period of Record: 1971-2000

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature (degrees F)													
Max	34.0	40.6	48.8	58.8	68.2	77.5	85.5	85.2	73.8	60.9	43.5	35.0	59.3
Min	11.8	17.1	24.3	31.06	39.7	46.9	51.4	49.7	40.3	31.7	21.1	12.7	31.5
Mean	22.9	28.9	36.6	45.1	54.0	62.2	68.5	67.5	57.1	46.21	32.3	23.9	45.4
Precipitation (inches)													
Max	1.34	1.54	1.88	2.44	5.50	5.47	5.57	2.76	3.50	2.68	1.31	0.95	5.57
Min	0.01	0.00	0.11	0.00	0.73	0.40	0.02	0.00	0.01	0.00	0.00	0.04	0.00
Mean	0.37	0.29	0.71	1.15	2.33	2.16	1.50	1.18	1.41	0.92	0.54	0.29	12.85*

Note:* Total Annual Precipitation
Source: NOAA, Western Regional Climate Center, 2004

Table 3.2-2 Belgrade, Montana Temperature & Precipitation Summary Period of Record: 1971-2000

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature (degrees F)													
Max	29.6	36.1	44.6	55.1	64.4	74.2	83.6	82.9	70.7	57.8	40.3	30.6	55.8
Min	7.6	13.5	21.0	29.0	37.1	43.8	48.8	47.6	38.5	28.8	17.1	8.0	28.4
Mean	18.6	24.8	32.8	42.1	50.8	59.0	66.2	65.3	54.6	43.3	28.7	19.3	42.1
Precipitation (inches)													
Max	1.69	1.52	2.36	2.69	6.20	4.68	4.62	2.17	3.17	3.17	1.64	1.61	6.20
Min	0.07	0.09	0.39	0.22	0.73	0.27	0.09	0.17	1.43	0.01	0.18	0.09	0.01
Mean	0.60	0.54	1.02	1.40	2.49	2.41	1.19	1.14	0.04	1.11	0.81	0.57	14.71*

Note: * Total Annual Precipitation
Source: NOAA, Western Regional Climate Center, 2004

Air Pollutants

Human activities and natural events generate gaseous and particulate air pollution. The most common form of air pollution is particulate matter or dust. Particulate matter can become airborne due to wind erosion, soil tilling, and vehicle traffic on paved and unpaved roads. Smoke from forest fires, agricultural burning, industrial sources and residential heating is also an important source of particulate matter pollution.

Most gaseous pollutants are generated by combustion activities. Combustion of organic fuels containing hydrogen and carbon results in the formation of carbon dioxide (CO_2) and water vapor. Incomplete combustion of carbon results in the formation of carbon monoxide (CO). Volatile organic compounds (VOCS) can be emitted as a result of unburned fuel or can be formed in the combustion process. Combustion causes the formation of nitrogen oxides (NO_x) emissions due to oxidation of nitrogen in the combustion air and in the fuel. Sulfur dioxide (SO_2) is also formed as a result of the oxidation of sulfur in the fuel during the combustion process. Combustion sources can emit trace amounts of hazardous air pollutants (HAPs), including organic compounds and hazardous metals compounds. The HAPs can be a portion of the unburned fuel or raw material or can be generated during combustion.

Criteria Air Pollutants

NAAQS and MAAQS for criteria air pollutants have been established based on health-based criteria. The gaseous criteria pollutants are CO, SO_2, ozone, and nitrogen dioxide (NO_2). Lead (Pb) and particulate matter (PM) are solid or particulate phase criteria pollutants. Ozone is formed in the environment as a result of photochemical reactions involving other pollutants. VOC emissions are regulated because they can contribute to the formation of ozone. Criteria pollutants are important because they endanger public health and the environment, are widespread throughout the U.S., and come from a variety of sources.
Federal and state air quality standards have been established for two sizes of particulate matter: particulate matter with an aerodynamic diameter of 10 microns or less (PM_{10}) and particulate matter with an aerodynamic diameter of 2.5 microns or less ($PM_{2.5}$). States and other agencies are gathering $PM_{2.5}$ data to determine the existing ambient concentrations of this particulate size fraction.

Hazardous Air Pollutants

HAPs, also known as air toxics, are those pollutants that are known or suspected to cause cancer or other serious health or environmental effects (EPA Toxics). HAPs are emitted in much lower quantities than the more common criteria air pollutants and are generally not found in the ambient environment in measurable amounts. EPA has identified 188 HAPs, which are included on the Hazardous Air Pollutants List (as defined in Section 112(b) of the CAA). The formation and emissions of HAPs from industrial sources are regulated through the National Emission Standards for Hazardous Air Pollutants (NESHAPs).

According to EPA's Air Toxics website, "people exposed to toxic air pollutants at sufficient concentrations and durations may have an increased chance of getting cancer or experiencing other serious health effects. These health effects can include damage to the immune system, as well as neurological, reproductive (e.g., reduced fertility), developmental, respiratory, and other

health problems. In addition to exposure from breathing air toxics, some toxic air pollutants such as mercury, can deposit onto soils or surface waters, where they are taken up by plants and ingested by animals and are eventually magnified up through the food chain. Like humans, animals may experience health problems if exposed to sufficient quantities of air toxics over time."
DEQ has identified general source categories of HAPs in Montana. Point sources include the oil and gas industry, mineral extraction and processing, chemical and cement plants, and the wood products industry. Area wide sources include dry cleaners, gas stations, residential woodstoves, and fireplaces and motor vehicle repair/refinishing facilities. Mobile sources include tailpipe emissions from automobiles, trains, and airplanes.

The main source of HAPs emissions from a portland cement plant is the kiln. Emissions originate from the burning of fuels and heating of feed materials. HAPs are also emitted from the grinding, cooling, and materials handling steps in the manufacturing process (EPA, March 2002).

Opacity

Opacity is a measure of the visibility of an air contaminant plume. Visible emissions can result from fugitive sources such as road dust, field tilling, or smoke. Visible emissions can also result from industrial sources, including material handling equipment and combustion sources. Although there is no numerical correlation between excess opacity and excess particulate emissions, increased opacity generally indicates increased particulate matter emissions. Causes of exceeded opacity can include start up, shutdown, process upsets, problems with air pollution control equipment or electrical power surges.

Opacity is defined in Montana's air quality regulations as "the degree, expressed in percent, to which emissions reduce the transmission of light and obscure the view of an object in the background (ARM 17.8.101(27))." Opacity does not include the steam vapor from a point source. If steam is present, the opacity can be measured only at the point in the plume where the steam dissipates. It is possible to measure stack gas opacity inside a large stack if the temperature is high enough to prevent water vapor from condensing within the stack.

Ambient Air Quality Standards

The MAAQS and NAAQS are listed in Table 3.2-3. These standards may not be exceeded in areas where the general public has access. National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health. National secondary standards are the levels of air quality necessary to protect the public welfare from known or anticipated adverse effects of a regulated air pollutant (40 CFR 50).

Table 3.2-3 Montana and National Ambient Air Quality Standards

Pollutant	Time Period	Federal (NAAQS)	Montana (MAAQS)	Standard type
Carbon Monoxide	Hourly Average	35 ppm [1 2] (40,000 $\mu g/m^3$)	23 ppm [b] (26,450 $\mu g/m^3$)	Primary
	8-hour Average	9.0 ppm [1] (10,000 $\mu g/m^3$)	9.0 ppm [b] (10,350 $\mu g/m^3$)	Primary
Hydrogen Sulfide	Hourly Average	- -	0.05 ppm [b]	- -
Lead	90-day Average	- -	1.5 $\mu g/m^3$ [c]	- -
	Quarterly Average	1.5 $\mu g/m^3$ [c]	- -	Primary & Sec.
Nitrogen Dioxide	Hourly Average	- -	0.30 ppm [b] (564 $\mu g/m^3$)	- -
	Annual Average	0.053 ppm [d] (100 $\mu g/m^3$)	0.05 ppm [e] (94 $\mu g/m^3$)	Primary & Sec.
Ozone	Hourly Average	0.12 ppm [f] (235 $\mu g/m^3$)	0.10 ppm [b] (196 $\mu g/m^3$)	Primary & Sec.
	8-hour Average	0.08 ppm [g] (157 $\mu g/m^3$)	- -	Primary & Sec.
PM_{10}	24-hour Average	150 $\mu g/m^3$ [k]	150 $\mu g/m^3$ [k]	Primary & Sec.
	Annual Average	50 $\mu g/m^3$ [l]	50 $\mu g/m^3$ [l]	Primary & Sec.
$PM_{2.5}$	24-hour Average	65 $\mu g/m^3$ [m]	- -	Primary & Sec.
	Annual Average	15 $\mu g/m^3$ [n]	- -	Primary & Sec.
Sulfur Dioxide	Hourly Average	- -	0.50 ppm [h] (1300 $\mu g/m^3$)	- -
	3-hour Average	0.50 ppm [a] (1300 $\mu g/m^3$)	- -	Secondary
	24-hour Average	0.14 ppm [a,i] (365 $\mu g/m^3$)	0.10 ppm [b,j] (262 $\mu g/m^3$)	Primary
	Annual Average	0.03 ppm [d] (80 $\mu g/m^3$)	0.02 ppm [e] (52 $\mu g/m^3$)	Primary

Notes:
[1] Federal violation when exceeded more than once over any 12 consecutive months.
[2] ppm parts per million
[3] μg/m micrograms per cubic meter
[a] Federal violation when exceeded more than once per calendar year.
[b] State violation when exceeded more than once over any 12 consecutive months.
[c] Not to be exceeded (ever) for the averaging time period as described in the state and/or federal regulation.
[d] Federal violation when the annual arithmetic mean concentration for a calendar year exceeds the standard.
[e] State violation when the arithmetic average over any four consecutive quarters exceeds the standard.
[f] Applies only to nonattainment areas designated before the 8-hour standard was approved in July, 1997. Montana has none.
[g] Federal violation when 3-year average of the annual 4th-highest daily max. 8-hour concentration exceeds standard.
[h] State violation when exceeded more than eighteen times in any 12 consecutive months.
[i] Federal standard is based upon a calendar day (midnight to midnight).
[j] State standard is based upon 24-consecutive hours (rolling).
[k] State and federal violation when more than one expected exceedance per calendar year, averaged over 3-years.
[l] State and Federal violation when the 3-year average of the arithmetic means over a calendar year at each monitoring site exceed the standard.
[m] Federal violation when 3-year average of the 98th percentile values at each monitoring site exceed the standard.
[n] Federal violation when 3-year average of the spatially averaged calendar year means exceed the standard.
Sources: MAAQS: ARM 17.8.201 et seq., Ambient Air Quality, NAAQS: Title 40 CFR 50.

Existing Air Quality

DEQ monitors ambient levels of criteria pollutants in areas where the department determines there may be a potential for elevated ambient concentrations of a particular pollutant. The monitoring data are used to determine whether air quality in the area complies with the MAAQS and NAAQS. If monitoring data show that a violation of the MAAQS or NAAQS has occurred, the area may be designated as a non-attainment area. Air quality in Gallatin County is classified as attainment for all criteria pollutants. The closest nonattainment area to Trident is the city of Butte, which is nonattainment for PM_{10}.

Air Quality Monitoring Data

PM_{10} is a problematic pollutant for many parts of Montana, including the Gallatin Valley. Sources of PM_{10} include industrial sources, motor vehicles, agricultural activities, forest fires, mining, road dust, and residential wood smoke. The PM_{10} areas of most concern in Gallatin County are within the towns of Bozeman and Belgrade (DEQ, July 2003).

DEQ has monitored PM_{10} and $PM_{2.5}$ in Bozeman and Belgrade for several years. Only the Belgrade monitoring station is currently being operated. Ambient samples for PM_{10} and $PM_{2.5}$ are taken every 3 days during fall and winter and every 6 days the rest of the year. Running all samplers on the same days allows reviewing agencies to determine which data were affected by an event that caused an anomalous reading. For example, high PM_{10} readings were flagged and omitted from both the Belgrade and Bozeman data sets on August 16, 2000, due to effects from forest fire smoke (EPA AirData).

A comparison of PM_{10} and $PM_{2.5}$ monitoring data from the year 2000 revealed a ratio between $PM_{2.5}$ and PM_{10} readings of 0.43. This indicates that 43 percent of the particulate matter smaller than 10 microns was smaller than 2.5 microns. According to DEQ, this indicates a normal ratio of smoke ($PM_{2.5}$) to dust (PM_{10}) (DEQ, July 2003). The most recent available ten years of data from the Bozeman and Belgrade PM_{10} monitors, which shows a decreasing trend, are summarized in Table 3.2-4.

Table 3.2-4 Gallatin Valley 24-hour Average PM_{10} Particulate Monitoring Data ($\mu g/m^3$)

Location	Year	Highest Reading	Second-Highest	Annual Average	No. of Samples
Belgrade	1991	127	123	55.5	32
	1992	133	131	43.5	108
	1993	137	121	45.2	118
	1994	93	81	36.9	94
	1995	148	124	33.4	97
	1996	74	74	28.3	111
	1997	81	65	27.6	107
	1998	72	71	29.0	113
	1999	70	62	25.2	105
	2000	65	65	23.6	90
	2001*	65	53	29.8	30
Bozeman	1991	122	108	29.5	103
	1992	56	54	22.9	118
	1993	58	47	23.7	108
	1994	53	52	23.1	87
	1995	101	72	20.7	95
	1996	46	43	21.7	110
	1997	104	53	20.6	102
	1998	68	57	19.3	113
	1999	51	40	17.9	89
	2000	46	42	18.6	76
	2001*	43	42	18.9	25

Note: * 2001 is a partial year.
Source: EPA AirData Website

Other Air Pollution Sources

Existing air quality in the Gallatin Valley is impacted by area source activities, such as vehicles, road dust, residential wood burning and agriculture. Existing industrial sources, including Holcim, also impact air quality. The influence of these sources is reflected in the ambient air quality data reported for Gallatin County. Industrial sources located within 50 km of the Holcim plant that currently hold a Montana air quality permit are listed in Table 3.2-5. EPA's facility emissions web site was used to identify emissions sources in Gallatin County (EPA AirData).

Neighboring Madison and Broadwater counties each have one permitted industrial emission source, both of which are located more than 50 km from the Holcim site.

Table 3.2-5 Gallatin County Industrial Emissions Sources

Facility Name	Location	Type of Source	Actual Emissions[1]	
Luzenac America	Sappington	Talc Processing Plant	CO – 0.94 tpy VOC – 0.19 tpy PM_{10} – 9.67 tpy	NO_x – 3.23 tpy SO_2 – 0.15 tpy
Luzenac America	Three Forks	Talc Processing Plant	CO – 4.3 tpy VOC – 0.52 tpy PM_{10} – 32.2 tpy	NO_x – 10.5 tpy SO_2 – 0.24 tpy
Montana State University	Bozeman	Central Heating Plant	CO – 0.51 tpy VOC – 0.88 tpy PM_{10} – 1.92 tpy	NO_x – 20.0 tpy SO_2 – 0.09 tpy
JTL Group	Belgrade	Portable Aggregate Crushing and Screening Plant	CO – 42.5 tpy VOC – 19.8 tpy PM_{10} – 40.0 tpy	NO_x – 3.12 tpy SO_2 – 24.4 tpy

Note: [1] Reported emissions in tons per year (tpy),
Source: (obtained from www.epa.gov/air/data/neidb.html for the most recent available year, 1999)

Table 3.2-5 lists actual emissions reported to DEQ and ultimately to EPA. EPA maintains emissions data for reference years to allow comparison of source data. The most recent year of data available from EPA is 1999. Emissions from industrial sources in Gallatin County are quite low and are not expected to impact the same receptors as the Holcim emissions. The primary source of emissions from talc processing and aggregate crushing is fugitive particulate matter. NO_x and CO are generated from burning natural gas and/or diesel for heating.

Holcim Trident Emissions

Portland cement manufacturing generates emissions of criteria pollutants, greenhouse gases, and HAPs. The primary source of criteria pollutant emissions is from the combustion of fuel to heat the cement kiln. Holcim is permitted to use coal, syncoal, petroleum coke and natural gas as fuels. Holcim is also allowed to use iron ore or ASARCO smelter slag for the iron component of the raw materials. For this EIS, current maximum potential emissions for Holcim's permitted production limit of 425,000 tons of clinker per year are called 'baseline' emissions. Maximum potential emissions while burning tires at the permitted production limit are called 'cumulative' emissions. Emission inventories also include HAP emissions from the addition of glass and smelter slag.

Criteria Pollutants

SO_2 emissions from cement kilns may be generated from oxidation of sulfur compounds in the raw materials and from sulfur in the fuel. The alkaline nature of the cement provides for direct absorption of SO_2 into the product, thereby mitigating the quantity of SO_2 emissions in the exhaust stream. Depending on the process and the source of the sulfur, SO_2 absorption ranges from about 70 percent to more than 95 percent (EPA, AP-42 Section 11.6).

NO_x is generated during fuel combustion by oxidation of chemically bound nitrogen in the fuel and by thermal fixation of nitrogen in the combustion air. CO is formed as a product of incomplete combustion of carbon in the fuel. VOC emissions may also result from incomplete combustion of the fuel or may form in the combustion process. Baseline potential annual criteria pollutant emissions from the Trident kiln are listed in Table 3.2-6.

Table 3.2-6 Baseline Potential Annual Kiln Emissions

Criteria Pollutants and CO_2	Maximum Potential Kiln Emission Rate
SO_2	543 tons/year
NO_x	6,868 tons/year
CO	121 tons/year
PM_{10}	164 tons/year
VOC	10 tons/year
Lead	0.15 ton/year
CO_2	446,250 tons/year

Source: Criteria Pollutant Emissions, DEQ Air Quality Permit 0982-10; Holcim 2004. CO_2 emissions estimate, AP-42 Section 11.6.

Table 3.2-6 also lists the estimated maximum CO_2 emission rate from the kiln, based on the applicable EPA emission factor (EPA, AP-42 Section 11.6). CO_2 emissions from portland cement manufacturing are generated by two mechanisms. Combustion of the fuels for generation of heat for the cement kiln releases substantial quantities of CO_2. CO_2 is also generated through calcining of limestone or other calcium carbonate material. There are no federal, state, or local air quality regulations addressing the emissions of CO_2 or other greenhouse gases. Estimates of greenhouse gas emissions are used primarily for emissions inventory purposes.

Hazardous Air Pollutants

Cement kiln emissions include residual organic compounds from the fuel or products of incomplete combustion, some of which are HAPs. Raw material feeds and fuel also contain trace amounts of heavy metals that may be emitted as particulate or vapor-phase HAPs (AP-42 Section 11.6). Holcim estimated baseline HAP emissions for use in its health risk assessment as described in Appendix A. The baseline inventory represents potential emissions from currently allowed kiln fuels and feeds. It contains estimated emissions from use of permitted fuels, with recycled glass used as a source of silicate in the kiln feed and iron ore or smelter slag as a source of iron. Baseline HAP emissions estimates (see 4.3.2.1, second paragraph) are listed in Table 3.2-7 using units of pounds of emission per year (lb/yr).

Table 3.2-7 Baseline Potential Annual Kiln HAP Emissions

Compound	Baseline (lb/yr)	Compound	Baseline (lb/yr)
Acetaldehyde	4,178	Chloroethane (ethyl chloride)	28.6
Acrolein	98.3	Formaldehyde	10,846
Trichloroethene	3.26	Hydrogen chloride	6,380
Antimony	3.52	Hydrogen fluoride	197
Arsenic	6.04	Lead	128
Benzene	9,237	Manganese	156
Beryllium	1.49	Mercury	102
Bis (2-ethylhexyl)phthalate	429	4-Methyl phenol	56.6
Bromomethane (Methyl Bromide)	43.2	Methylene chloride	366
1,3 Butadiene/Butadiene	31.0	Naphthalene	572
2-Butanone (MEK)	8.94	Nickel	15.8
Butylbenzylphthalate	0.53	Nitrobenzene	13.5
Cadmium	9.10	4-Nitrophenol	287
Carbon Disulfide	1,141	Phenol	930
Carbon Tetrachloride	3.35	Phosphorus	32.2
Chlorine	5,272	Selenium	75.8
Chlorobenzene	67.9	Styrene	2,373
Chloromethane (Methyl chloride)	436	1,1,1 Trichloroethane	1.61
Chromium (total)	13.90	Toluene	11,546
Chromium 6	2.42	Vinyl chloride	93.7
Cobalt	9.18	Xylenes, total	8,567
Di-n-Butyphthalate	13.4	Zinc(1)	4,943
1,4 Dichlorobenzene	13.4	TCDD Eq. (2)	0.0000074
Dichloromethane	394	Total PCBs	3.88
Dimethyl Phthalate	18.6	PAH- Total	756
2,4-Dinitrophenol	101	PAH-Non-carcinogenic totals	183
Ethylbenzene	1,945	PAH-Carcinogenic totals**	573

Note: (1) Zinc is not a HAP but is a common constituent in tires.
(2) The TCDD eq. baseline value is based on Holcim's 2000 stack test, increased proportionally from actual to potential production.
Source: Appendix B

Regulatory Requirements

EPA has approved the State of Montana to implement many of the requirements of the federal CAA. Montana has developed and maintains an air pollution control plan referred to as the State Implementation Plan, or SIP. The Montana SIP explains how Montana will ensure compliance with standards as required under the CAA. In general, the SIP is the collection of programs, policies, orders, and laws that Montana uses to attain and maintain the primary and secondary NAAQS.

Montana Air Quality Permits

Holcim currently operates under Montana Air Quality Permit #0982-10, which was final on December 4, 2001, and Montana Air Quality Operating Permit #OP0982-00, which was final on

July 26, 2001. These permits contain all of the applicable state and federal air quality regulations and permit conditions governing the operation of the cement plant. Holcim is required to submit a Montana Air Quality Permit Application when proposing to construct, install, modify, or change the operation of the facility beyond certain thresholds (ARM 17.8.740 *et. seq.*). Modifications approved by DEQ and placed in the air quality permit are then incorporated into the operating permit through ARM 17.8.1201 *et seq*.

Holcim's air quality permits incorporate applicable federal regulatory programs, including the New Source Performance Standards (NSPS) and NESHAPs. Operating Permit #OP0982-00, alone, contains 290 facility-specific permit conditions in addition to 57 general permit conditions. Permit #0982-10 contains emission limits and operating requirements for stationary equipment at the facility. Current kiln emission limits include PM_{10}, SO_2, NO_x, and opacity limits. As a condition of Permit #0982-10, Holcim is required to install and operate continuous emissions monitoring systems (CEMS) to continuously analyze and record the emissions of NO_x and SO_2 from the kiln stack.

Emissions from the Holcim kiln are limited to less than 20 percent opacity during normal operation and less than 10 percent opacity when using post-consumer recycled glass. The opacity limits require an averaging period of six consecutive minutes. Holcim has installed a Continuous Opacity Monitoring System (COMS) to improve monitoring of opacity from the kiln. The COMS is not required currently by any regulation or permit condition and is not certified. Holcim uses the COMS for informational purposes. The compliance-determining method for opacity at Holcim is currently EPA Reference Method 9.

Glass Recycling/Slag Use

Holcim's air quality permits allow the facility to use post-consumer recycled glass as a source of silica in the kiln. The glass replaces silica that would otherwise be obtained from a mine. Holcim began to use the glass in 1999 after DEQ's Air, Energy and Pollution Prevention Bureau requested that Holcim and other facilities in the area consider incorporating recycled post-consumer glass into their process. Holcim's air quality permit allows the use of up to 800 tons of recycled glass during any rolling 12-month period.

Permitting for the use of recycled glass in the kiln feed was subject to the Montana incinerator regulations and negligible risk standards (ARM 17.8.770). Holcim submitted an emission inventory that identified 5.13 pounds per year (lb/yr) of HAPs being emitted as a result of using post-consumer recycled glass. Holcim also submitted a health risk assessment that demonstrated that this proposal constituted a negligible risk to human health and the environment.

DEQ set the 800 ton-per-year glass limit based upon the fact that Holcim did not expect to use more than that amount. Holcim's Permit #0982 contains an alternative operating scenario for firing using 800 tons of post-consumer recycled container glass. The alternative scenario limits the opacity to less than 10 percent while glass is being used in the kiln. Holcim is not required to use recycled glass in the cement kiln and may discontinue the practice at any time.
Iron is an ingredient in portland cement. Holcim's air quality operating permit allows the use of iron ore as a source of iron in the kiln. It can also use up to 15,000 metric tons (16,535 tons) of slag from the ASARCO smelter in East Helena during any rolling 12-month period as an iron

source. The ore or smelter slag makes up 2 to 4 percent of the kiln feed, depending on the iron content.

Montana Negligible Risk Standard

Holcim has applied for a modification to Permit #0982 to allow the use of tires as a supplemental fuel. It submitted the application for a permit modification under the incinerator permit requirements of 75-2-215, MCA. Regulations in ARM 17.8.770 require that an applicant for a Montana Air Quality Permit for an incineration facility subject to 75-2-215, MCA, shall submit a human health risk assessment protocol and a human health risk assessment as part of the application. Holcim submitted a human health risk assessment with the air quality permit application requesting permission to use tires as fuel (Holcim, 2004).

The human health risk assessment must include an emissions inventory listing potential emissions of all pollutants specified in the CAA HAPs list. It must also include a characterization of emissions and ambient concentrations of air pollutants, including HAPs, from any existing emitting unit at the facility. The human health risk assessment must demonstrate that the ambient concentrations of pollutants resulting from emissions from the incineration facility constitute no more than a negligible risk to the public health, safety, and welfare, and to the environment (ARM 17.8.770).

NESHAPs

Under the CAA Amendments of 1990, EPA is required to regulate emissions of 188 listed HAPs. EPA has identified industries, including portland cement manufacturing, that are potentially major sources of air toxics. “Major” sources are those that emit 10 tons/year or more of a single HAP or 25 tons/year or more of a combination of HAPs. For listed categories of major sources, the CAA requires EPA to develop standards that require the application of stringent air pollution controls (EPA, March 2002).

The standards that EPA developed are known as NESHAPs. EPA issued the final NESHAPs for portland cement manufacturing in June 1999, with amendments in March 2002. That rule required the application of Portland Cement Maximum Achievable Control Technology (PC MACT) for cement plants that are major sources (EPA, March 2002). The NESHAPs for Portland Cement Plants are included in the Code of Federal Regulations (CFR) Title 40, Part 63, Subpart LLL.

Permit #0982-10 requires that Holcim comply with the limitations of the NESHAPs for portland cement plants. The permit limits the emissions of dioxins (certain by products of combustion) and furans (flammable liquids used as solvents) and requires monitoring of the kiln outlet temperature and source testing to verify compliance with the dioxin and furan limits. Dioxin and furan limits are expressed as tetrachlorodibenzo-p-dioxin equivalent (TCDD eq.).
The Trident facility is designated as an area source for purposes of PC MACT requirements. In order to qualify as an area source, the source must not be a major source as defined above. Holcim intends to maintain its area source status after completion of the Proposed Action by limiting individual and total HAP emissions. Holcim completed testing to determine if emissions of HAPs and HCl could re-designate the facility as an area source. Results of the

testing indicated that it was an area source for the purposes of determining the applicability of PC MACT.

PSD Classification

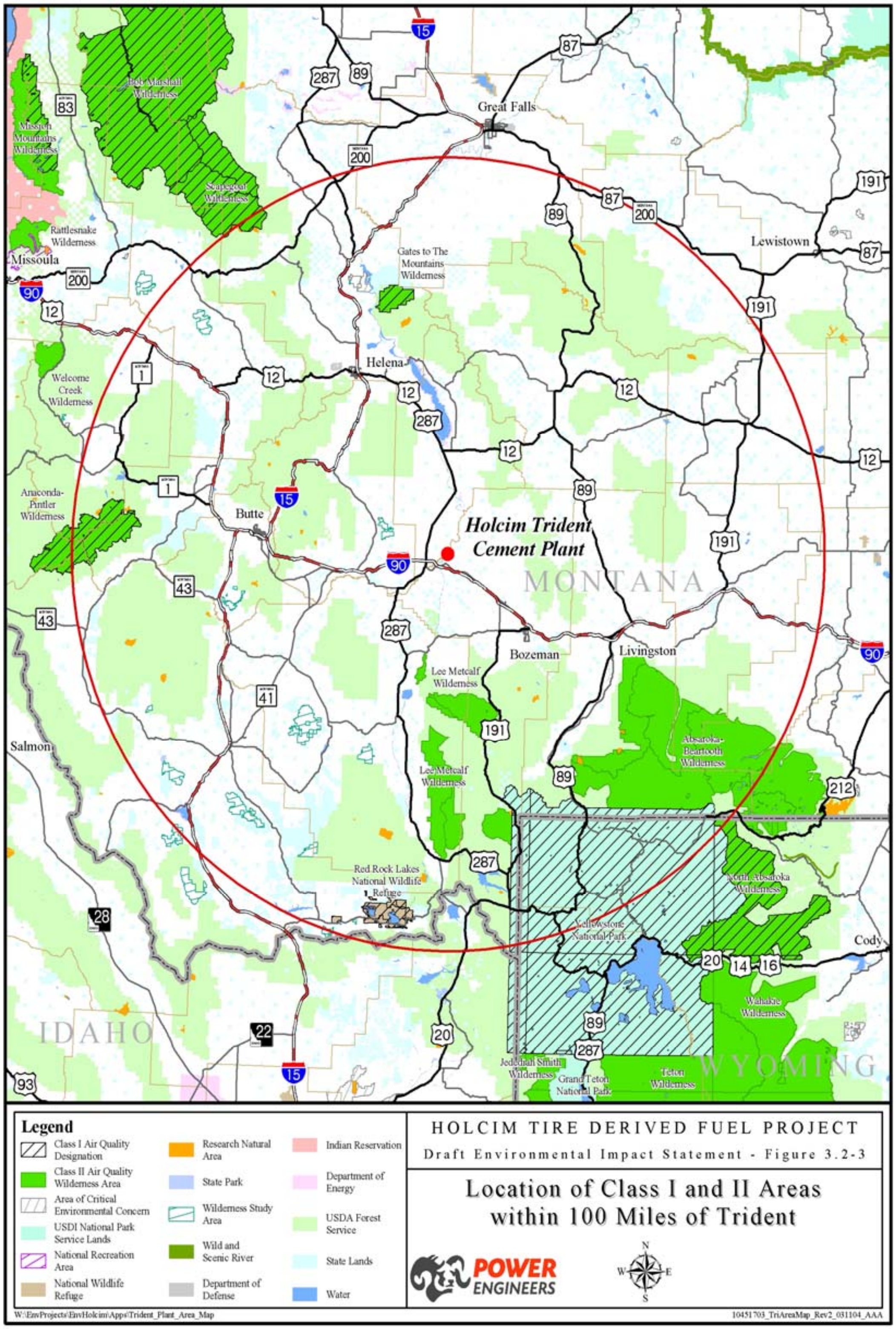
Montana's air quality permitting regulations include implementation of the federal Prevention of Significant Deterioration (PSD) program. Montana regulations covering the PSD program are contained in ARM 17.8.801 *et seq*. PSD regulations contain provisions for designating Class I, Class II, or Class III areas. Most of Montana is designated Class II, although there are a number of Class I areas. There are no Class III areas in Montana.

The area surrounding the Trident facility is a designated Class II area as defined by the PSD program. The PSD Class II designation allows for moderate growth or degradation of air quality within certain limits above baseline air quality. Large industrial sources proposing construction or modification must demonstrate that the proposed emissions would not cause significant deterioration of air quality in all areas.

The air quality regulations for PSD Class I and Class II areas contain limits on the allowable increases in PM_{10}, NO_x, and SO_2 impacts. Ambient air quality standards are the same for Class I and Class II areas. The PSD permitting regulations also include protection of air quality related values (AQRV) in mandatory federal Class I areas, including but not limited to visibility. The PSD Class I designation provides the most protection for air quality in specific national parks, wilderness areas, and Indian reservations. The standards for significant deterioration are much more stringent for Class I areas than for Class II areas. Some Montana wilderness areas are designated Class II areas. Figure 3.2-3 shows the Class I areas and Class II wilderness areas within 100 miles of the Trident site.

The closest Class I area is Yellowstone National Park, with the nearest boundary approximately 62 miles (100 km) south of Trident. Other Class I areas located within 100 miles of Trident include the Gates of the Mountains Wilderness Area, located 67 miles (108 km) northwest of the site, the Anaconda-Pintler Wilderness Area 86 miles west of the site, the Red Rock Lakes National Wildlife Refuge 92 miles south-southwest of the site, and the Scapegoat Wilderness Area 98 miles northwest of the site. The Class I North Absaroka Wilderness Area in Wyoming is 98 miles southeast of the site. The Absaroka-Beartooth Wilderness Area north of Yellowstone National Park is a Class II wilderness area. The northernmost boundary of the Absaroka-Beartooth Wilderness Area is 54 miles southeast of Trident. The northern unit of the Class II Lee Metcalf Wilderness Area is 38 miles south of Trident.

Figure 3.2-3 Class I and II Areas Location Map



Human Health Risk Evaluations for Incinerators

ARM 17.8.770 requires that:

> *An applicant for a Montana air quality permit for an incineration facility subject to 75-2-215, MCA, shall submit a human health risk assessment protocol and a human health risk assessment as part of the application. The human health risk assessment must demonstrate that the ambient concentrations of pollutants resulting from emissions from the incineration facility subject to 75-2-215, MCA, constitute no more than a negligible risk to the public health, safety, and welfare and to the environment.*

According to 75-2-215, MCA (Solid or hazardous waste incineration -- additional permit requirements):

> *Until the department has issued an air quality permit pursuant to* 75-2-211 *that includes the conditions required by this section, a person may not construct, install, alter, or use a solid or hazardous waste incinerator or a boiler or industrial furnace subject to the provisions of* 75-10-406*, except as provided in subsection (2). … The department may not issue a permit to a facility described in subsection (1) until:*
>
> *(a) the owner or operator has provided to the department's satisfaction:*
>
> *(i) a characterization of emissions and ambient concentrations of air pollutants, including hazardous air pollutants, from any existing emission source at the facility; and*
>
> *(ii) an estimate of emissions and ambient concentrations of air pollutants, including hazardous air pollutants, from the incineration of solid or hazardous waste or the use of hazardous waste as fuel for a boiler or industrial furnace, as proposed in the permit application or modification; ….*
>
> *(d) the department has reached a determination that the projected emissions and ambient concentrations will constitute a negligible risk to the public health, safety, and welfare and to the environment; ….*

A "negligible risk to the public health, safety, and welfare, and to the environment" is referred to as the negligible risk standard and is defined in 17.8.740(10) as follows:

> *Negligible risk to the public health, safety, and welfare and to the environment" means an increase in excess lifetime cancer risk of less than 1.0×10^{-6}, for any individual pollutant, and 1.0×10^{-5}, for the aggregate of all pollutants, and an increase in the sum of the non-cancer hazard quotients for all pollutants with similar toxic effects of less than 1.0, as determined by a human health risk assessment conducted according to ARM* 17.8.767*. The department shall also consider environmental impacts identified in any environmental analysis conducted pursuant to the Montana Environmental Policy Act, Title 75, chapter 1, parts 1 through 3, MCA, in determining compliance with all applicable rules or*

> *other requirements requiring protection of public health, safety, and welfare and the environment"*

ARM 17.8.770 describes the requirements for the human health risk assessment. The applicant must submit a human health risk assessment protocol detailing the human health risk assessment procedures. At a minimum, the human health risk assessment protocol must include: a description of the pollutants considered in the analysis; methods used in compiling the emission inventory; ambient dispersion models and modeling procedures used; toxicity values for each pollutant; exposure pathways and assumptions; any statistical analysis applied; and any other information necessary for the department to review the adequacy of the human health risk assessment.

The health risk assessment must be performed in accordance with accepted human health risk assessment practices, or state or federal guidelines in effect at the time the human health risk assessment is performed, and must address impacts on sensitive populations. The human health risk must be calculated using the emitting unit's potential to emit. Enforceable limits or controls may be considered. DEQ may impose additional requirements for the human health risk assessment, on a case-by-case basis, if it reasonably believes that the type or amount of material being incinerated, the proximity to sensitive populations, short-term emissions variations, acute health impact, or the local topographical or ventilation conditions require a more detailed health risk assessment to adequately define the potential public health impact.

Holcim Compliance History

DEQ performs regular reviews of the Holcim facility reports to verify compliance with the conditions and limitations of Holcim's air quality permits and applicable air quality programs. Compliance information for the past three years can be viewed on EPA's Enforcement & Compliance History Online (ECHO). ECHO lists the facility's compliance status in four categories: Section 63 NESHAPs, Title V Operating Permit, SIP, and NSPS. Aside from the recycled glass violations described below, Holcim was in compliance in all four categories in the 11 calendar quarters from January 2003 through September 2005.

Holcim submits semi-annual monitoring reports to DEQ, containing the results of required monitoring and testing at the facility. No violations have been recorded in the past two years based on NO_x and SO_2 CEMS readings and stack testing. Violations associated with glass recycling are described below. Holcim also submits Facility Upset Reports. DEQ regularly reviews the Facility Upset Reports.

DEQ conducts site visits of the Holcim facility as necessary. The latest air quality field inspection was conducted on August 31, 2005. DEQ also observed source testing at Holcim in October 2005, August 2005, December 2004, and August 2004. Results of the field inspection and source testing indicate that Holcim is in compliance with the conditions and limitations of Holcim's air quality permits and applicable air quality programs.

Kiln Malfunctions Affecting Emissions

Malfunctions are defined in ARM 17.8.110 as follows:

> "*Malfunction" means any sudden and unavoidable failure to operate in a normal manner by air pollution control equipment, process equipment, or a process that affects emissions. A failure caused entirely or in any part by poor maintenance, careless operation, poor design, or any other preventable upset condition or preventable equipment breakdown is not a malfunction.*

DEQ must be notified of all malfunctions expected to exceed any emission limitation or to continue more than 4 hours. Holcim submits initial upset reports to DEQ by facsimile or telephone within 24 hours of an upset. Initial upset reports must identify the emission point, list the cause of the upset, and describe corrective actions taken. Within 1 week after an upset has been corrected, Holcim is required to submit a detailed Facility Upset Report that verifies that the upset has been corrected, describes the cause of the upset and preventative steps taken, and states whether or not the upset was caused by poor maintenance, careless operation, or another preventable condition. Each Facility Upset Report is reviewed individually to determine if an upset is a reportable malfunction, if any violation occurred, and if enforcement action is warranted.

Review of Holcim's 2002 through 2004 upset reports revealed that many of the reported upsets exceeded the opacity limit. Causes of these upsets include process problems, mechanical or electrical failures, and production start-up and shut down.

Excess Opacity

Holcim voluntarily installed an uncertified COMS to continuously monitor the opacity of the kiln stack exhaust. The COMS measures opacity and can report opacity for essentially any averaging time. Holcim submits Facility Upset Reports to DEQ for opacity values that exceed 20 percent. DEQ historically compiled a 12-month average of total reported opacity exceedances for the Holcim cement kiln. During the calendar year from January 2002 through December 2002, Holcim reported excess opacity for a total of 6.3 percent of the kiln operating hours. By using the COMS data, Holcim reported a number of opacity events that did not last the 6-minute averaging period. Only opacities that are greater than 20 percent when averaged over 6 consecutive minutes are violations. Without these additional reports, the excess opacity total would be lower. Holcim now reports when the opacity limit is exceeded for 6 minutes or longer. DEQ reviews the opacity data quarterly.

By regulation, Holcim's opacity must be less than 20 percent averaged over 6 consecutive minutes during regular operations and less than 10 percent averaged over 6 consecutive minutes when the kiln is processing recycled glass in the raw mix (ARM 17.8.304(2) and 17.8.316(3)). Based on the information gained from the COMS, Holcim has made a number of changes in kiln operations, resulting in a reduction in the frequency of opacity exceedances. During the calendar year from January 2003 through December 2003, Holcim reported excess opacity for a total of 2.51 percent of the kiln operating hours (DEQ Files).

Table 3.2-8 shows the percentage of operating time by quarter that Holcim reported upsets for the kiln in 2004 and 2005.

Table 3.2-8. Holcim 2004-2005 Kiln Upsets on a Percentage of Operating Time Basis

Quarter	Kiln Upsets
1st Quarter 2004	**0.31% of operating time**
2nd Quarter 2004	**1.48% of operating time**
3rd Quarter 2004	**2.13% of operating time**
4th Quarter 2004	**1.9% of operating time**
1st Quarter 2005	**3.8% of operating time**
2nd Quarter 2005	**0.75% of operating time**
3rd Quarter 2005	**0.65% of operating time**
4th Quarter 2005	**Not available**

Recycled Glass Violations

On two occasions, Holcim reported that it had used more than 800 tons of recycled glass during a rolling 12-month reporting period. Holcim first exceeded the 800-ton limit in January 2001 and remained in violation until June 2001. DEQ issued a violation letter and an administrative order on consent and collected a penalty of $2,400 on January 12, 2003.

The second violation of the 800-ton limit occurred in October 2002 and continued through May 2003. DEQ issued a violation letter and Holcim paid a penalty of $41,600 on April 16, 2004. After the second case of Holcim exceeding its glass-recycling limit, EPA assigned Holcim the designation of High Priority Violator (HPV), as reported on the ECHO website. The violation was resolved on or around April 15, 2004, and the HPV status now shows the facility in compliance.

Slag

DEQ sampled ASARCO smelter slag at the smelter and at Holcim's plant. The samples were analyzed for total metals, volatile organic compounds, semi-volatile organic compounds, polychlorinated biphenyls, chlorides, and pH. Metals, chlorides, and pH were detectable at the reporting limits of the analytical methods used.

DEQ estimated the amount of slag that would be needed to meet the iron requirements to produce 425,000 tons of clinker and determined the amount of metals that would be introduced to the kiln. DEQ assumed that 95 percent of the metals would be captured in the product and 5

percent would go to the ESP. The amounts of metals found in the slag samples were used in the risk assessment model.

Holcim has agreed to limit its use of smelter slag to 15,000 metric tons during any rolling 12-month time period until DEQ makes its decision on permitting the use of tires as fuel.

3.3 Soils

This section describes the soils within the 50-km (31.06-mile) study area. Emphasis has been placed on farmland designation, because emissions from the Holcim cement plant have the potential to affect produce from area farms and ranches and, thereby, affect human health through ingestion (refer to Chapter 4 for the human health risk). Complete soil series descriptions may be found at the Natural Resources Conservation Service (NRCS) web site (NRCS, 2004).

Chemicals of Potential Concern (COPC) deposited on soils can be ingested directly by most organisms by virtue of their burrowing (e.g., earthworms, hares), or other means. Herbivores may consume soil attached to vegetation and roots. Carnivores ingest soils through consumption of ground-nesting prey, licking or cleaning their feet, licking mineral deposits, or eating soil that contains urine or other attractants. Thus, the soil medium may play an important role in the food chain, and COPCs deposited on the ground and vegetation can affect organisms throughout the food web.

3.3.1 Inventory Methods

Soils were mapped using both the State Soil Geographic (STATSGO) and the Soil Survey Geographic (SSURGO) databases from the NRCS. STATSGO data are meant to be used at very large scales as an overview of soil types; therefore, they were used only for graphical purposes. SSURGO data are the most accurate available and were used for prime farmland analysis. Written descriptions in Section 3.3.2.3 are derived from NRCS (formerly the Soil Conservation Service [SCS]) soil surveys for Broadwater and Gallatin counties (SCS, 1977; NRCS, 2002). These two sources were organized differently, and in ways that precluded merging the soils descriptions. This arrangement facilitated use of the advantages of each organizational concept, using the Broadwater County descriptions to describe soils by where they are found in the landscape (bottomlands, terraces), and using the Gallatin County descriptions for soils favorable for farming.

3.3.2 Inventory Results

Section 3.3.2.1 provides general soil descriptions segregated by where they are found in the landscape (i.e., bottomlands, terraces, etc.), which is how they are organized in the soil survey for Broadwater County. These descriptions include soil formation, parent material, geomorphology, soil texture, and uses. Section 3.3.2.2 gives an estimate of the relative acreage of different soils within 10 km (6.21 miles) of Trident. Section 3.3.2.3 describes designated prime farmland soils from the soil survey for Gallatin County, which is organized by land use.

Soils Characteristics

Bottom Land

These soils are formed in material deposited by the Missouri River and its tributaries and include the Villy-Toston-Rivra association. Most of these soils have slopes of 1 to 5 percent, making them nearly level to gently sloping and gently undulating, deep, poorly drained to moderately well drained soils on low terraces and flood plains. Most of the area has an irregular surface because of past and present stream channels on the flood plain (SCS, 1977).

The surface layer for these soils is light-gray to grayish-brown silty clay loam and silt loam, between two and seven inches thick, or light brownish-gray to grayish-brown gravelly loam, about four inches thick. The underlying material is stratified light-gray to gray silty clay loam and silt loam; very pale brown or light-gray to gray silty clay loam to silt loam; or light brownish-gray very gravelly sand. The seasonal high water table is at a depth between 20 and 72 inches.

This soil association is used mainly for pasture and hay. Some areas are drainable, but the areas near the streams generally do not drain well.

Intermediate Terraces and Fans

These soils are formed in material deposited by water and wind, and are comprised of the three associations in Table 3.3-1. The soils have slopes of 0 to 35 percent, and are nearly level to steep, deep, well-drained soils on terraces, fans, mountain foot slopes, and uplands. These areas are smooth except where intermittent streams dissect the landscape. These soil associations can be used for irrigated and dry farmed cropland, rangeland, and pasture.

Table 3.3-1 Soils on Intermediate Terraces and Fans

Soil Associations	Surface Layer Colors and Textures
Amesha-Brocko-Mussel	Light gray to brownish gray loams to silt loams.
Radersburg-Hilger-Scravo	Grayish brown to dark grayish brown very cobbly loam to extremely stony loam.
Chinook-Amesha	Grayish brown sandy loam to brownish gray loam.

Source: SCS, 1977; NRCS, 2002

High Terraces and Fans

These soils are in four soil associations and formed in material deposited by water and in material weathered in place from bedrock. The soils have slopes of 2 to more than 35 percent, and are gently sloping and rolling to steep, moderately deep to deep, well-drained soils located on fans and high fans, terraces, benches, ridges, side slopes of uplands, and on mountainous uplands. Deep, intermittent and perennial streams dissect this landscape. Sharp ridges, deep canyons and fans are common. North-facing slopes are uniformly timbered, but grassland park areas are common along ridges and on the upper parts of south-facing slopes. Rock outcrops can be visible above the timber in some areas. These soil associations can be used for dry farmed

winter wheat and barley, irrigated crops, pasture, hay, range, timber, woodland grazing, and wildlife habitat.

Table 3.3-2 Soils on High Terraces and Fans

Soil Associations	Surface Layer Colors and Textures
Sappington-Martinsdale	Grayish brown to dark grayish brown clay loam.
Passcreek-Bridger-Rooset	Grayish brown, dark grayish brown, brown or pale brown channery* silt loam, cobbly loam, or extremely stony loam.
Lake Creek-Whitore-Loberg	2-3 inches of forest litter over light brownish gray, grayish brown or light gray channery* loam, channery silt loam or very stony loam.
Musselshell-Crago	Brownish gray to light brownish gray cobbly loam.

Note: *A descriptive term used for thin and flat limestone, sandstone, or schist fragments up to 15 cm (6 inches) in length.
Source: SCS, 1977; NRCS, 2002

Shale and Sandstone Uplands

The soils on shale and sandstone uplands are in the Abor-Cabbart-Delphill soil association and formed in material weathered in place from clay shale, sandstone, and siltstone. These soils have slopes of 2 to 35 percent and range from shallow to moderately deep. They are found on undulating to rolling sedimentary uplands that are frequently dissected by intermittent streams. The drainageways are shallow to deep and have moderately steep to steep side slopes. These soils have a surface layer of grayish-brown, calcareous silty clay, grayish-brown loam or light brownish-gray loam, respectively. The underlying material is either light brownish-gray, partially weathered clay shale or very pale brown clay loam. This association is used mainly for dry land small grains and range (SCS, 1977; NRCS, 2002).

Mountainous Uplands

These soils are in two soil associations and formed in material weathered from argillite, limestone, and igneous rock and in material that has moved down slope from the source. They have slopes of 9 to 60 percent and range from shallow to deep. These soils are found in a complex landscape consisting of smooth and round to sharp and narrow ridge tops and side slopes that range from sloping to very steep, including some steep-walled canyons. Much of this area is drained by a branching pattern of smooth, grassed drainage ways, and areas of rock outcrop are common. Bedrock is at an approximate depth of between 8 and 50 inches. These soil associations are used mainly for range. Some areas are used for timber production and for year-round recreation (SCS, 1977; NRCS, 2002).

Table 3.3-3 Soils on Mountainous Uplands

Soil Associations	Surface Layer Colors and Textures
Tropal-Rencot-Tolman	Grayish brown gravelly loam, pale brown channery loam, or brown channery loam, respectively.
Cheadle-Nielsen-Ess	Dark brown stony loam, dark brown gray channery loam, very dark grayish brown stony loam, respectively.

Source: SCS, 1977; NRCS, 2002

Soils within 10 Kilometers of Trident

All STATSGO soils occurring within the 10-km (6.21-mile) radius of the Trident plant are shown below in Table 3.3-4. Descriptions of these soil mapping associations can be found in Section 3.3.2.1, above, or at the NRCS web site (NRCS, 2004).

Table 3.3-4 Soils Within 10-km (6.2 mi) Radius of Trident Plant

Soil Mapping Unit	Acreage	Percent
Amesha-Brocko-Musselshell	11,729	15.1
Brocko-Amesha-Crago Variant	843	1.1
Brocko-Floweree-Rothiemay	431	0.6
Busby-Brocko-Crago Variant	2,227	2.9
Busby-Kalsted-Cetrack	85	0.1
Neen-Trudau-Rivra	1,225	1.6
Brocko-Pensore-Rock Outcrop	12,531	16.2
Pensore-Tolman-Rock Outcrop	15,035	19.4
Rentsac-Brocko-Crago Variant	11,727	15.1
Rivra-Cardwell-Ryell	21,176	27.3
Whitore-Hanson-Whitecow	502	0.6
Total Acres/Percent	**77,511**	**100**

Source: STATSGO, 2004

Prime Farmland

Prime farmland is described as follows (NRCS, 2002):

> *Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. … Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.*
>
> *Prime farmland soils may presently be used as cropland, pasture, forest land, or for other purposes. … Urban or built-up land, public land, and water areas cannot be considered prime farmland.*

Prime farmland is emphasized because of its importance for both environmental consideration and for human health consideration. It is also emphasized in this section because of its dual significance in assessing impacts from Holcim's proposed permitting changes, and because prime farmland is generally located on bottomlands with gentle slopes and available moisture. These tend to be the areas of highest human population concentrations as well.

Prime farmland designations were identified using the 1:24,000 scale SSURGO soils database from the NRCS. Complete data were not available for the entire regional 50-km (31.06-mile)

area but were available for the 10-km (6.21-mile) area. Acreages based on all available data for the regional area are presented below in Table 3.3-5.

Table 3.3-5 Regional Prime Farmland Acreage (within 50 km [31.06 miles]) of Trident

Farmland Classification	Regional Area Acreage	Regional Area Percentage
Prime Farmland	43,071	2.2
Prime Farmland if Irrigated	171,031	8.8
Farmland of Statewide Importance	174,611	9.0
Not Prime Farmland	1,306,067	67.4
Total Acres of Available Data	1,694,780	87.5
Total Acres in Regional Area	**1,937,790**	**100.0**

Source: NRIS, 2004

Designated prime farmland is located mainly southeast of Trident, with some smaller areas east and north. Farmland that is “prime if irrigated” and “farmland of statewide importance” (as defined in USDA-NRCS, 2002) is distributed throughout the region within 50 km (31.06 miles) of Trident. Virtually all of these designated soils are bottomlands or stream terraces. While there is no designated prime farmland within 10 km (6.21 miles) of the Trident plant, substantial acreage of “prime if irrigated” and “farmland of statewide importance” occurs within 10 km (6.21 miles) of Trident. More information about any of the soil series represented below can be found at the NRCS web site (NRCS, 2004).

3.4 Water Resources

Holcim’s Trident cement plant is on the banks of the Missouri River. It is approximately 1.6 km (1 mile) downstream from Missouri Headwaters State Park, where the Jefferson, Madison, and Gallatin rivers meet to form the Missouri River.

Hydrology is documented in this chapter as follows: water quantity, water quality, groundwater, and water use. Related information about streams and lakes is found in Section 3.7, Fisheries and Aquatics.

Existing data were used to characterize current water quality conditions in the study area. The Holcim cement plant has been in operation since approximately 1910. No water quality or quantity data from before the plant’s operation were found. Water use and water quality impacts from general population growth, industry, agriculture, and distant sources have acted on the study area to various degrees. Consequently, it is beyond the scope of this document to try to isolate sources of impacts and their magnitude over the period of the plant’s operation.
In addition to being habitat for fish and other aquatic organisms, surface water is used to irrigate crops throughout the region, and domestic livestock often get drinking water directly from surface sources, as do wildlife. Although most domestic water supplies are now from groundwater, humans have direct contact with surface water through recreation and consumption

of locally caught fish. Thus the medium of water plays a critical role in both human and ecological health.

3.4.1 Inventory Methods

All inventory data are from published sources, including electronic files from Natural Resource Information System (NRIS). The NRIS files were accessed in February and March of 2004 and were authored by the U.S. Geological Survey (USGS), EPA, Montana Bureau of Mines and Geology (MBMG), DEQ, Montana Fish, Wildlife and Parks (MFWP), and other agencies.

3.4.2 Inventory Results

Water Quantity

The types of natural and man-made water bodies in the local and regional area of the Holcim plant are shown in Table 3.4-1.

Within 10 km of Trident, the National Hydrography database (NRIS, 2004) shows seven lakes, with a combined surface area of 87 acres, the largest being 39.8 acres and the smallest being 2.8 acres (average 12.4 acres). Within 50 km of Trident the database shows 53 lakes with a combined surface area of 5,900 acres (average 111 acres), including about 3,374 acres of Canyon Ferry Reservoir. If Canyon Ferry is omitted, the average surface area goes down to 48.6 acres with Willow Creek Reservoir being the largest (713 acres) and an un-named pond being the smallest at 0.85 acres (NRIS, 2004).

Table 3.4-1 Hydrography

Category	Within 10 km (6.21 mi) of Trident	Within 50 km (31.06 mi) of Trident
Perennial Streams	123 miles	2,178 miles
Intermittent Streams	159 miles	2,708 miles
Canal, Ditch, or Aqueduct	7 miles	753 miles
Lakes	87 acres	5,900 acres
Lake Shoreline	6 miles	68 miles

Source: National Hydrography database/NRIS, 2004

Table 3.4-2 lists drainage areas for the Madison, Jefferson, Gallatin, and Missouri rivers as measured for nearby USGS gaging stations. The drainage areas for these rivers are extensive. Proximity to the Continental Divide, combined with the number of mountain ranges and area of high country, accounts for the relatively high volume of water from these drainages. Where precipitation may be limited to 12 inches/year in western Montana valleys, it can be upwards of 50 inches/year in the high country fewer than ten miles away.

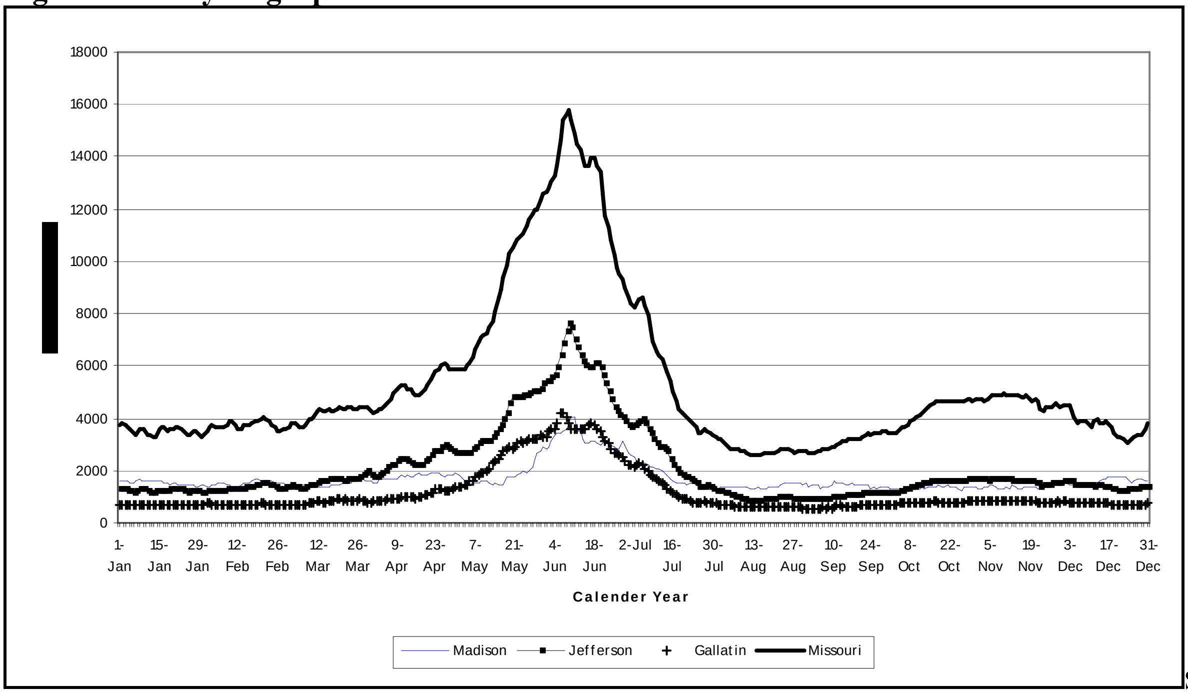
Table 3.4-2 Drainage Area for Missouri River Headwaters

River	USGS Station Name	Station Number	Drainage Area (sq mi)	Annual Mean Streamflow (cfs)[1]
Jefferson River	Jefferson River near Three Forks	06036650	9,532	2090
Madison River	Madison River at Three Forks	06042600	2,531	1709
Gallatin River	Gallatin River at Logan	06052500	1,795	1163
Missouri River	Missouri River at Toston	06054500	14,669	5208

Note: [1] based on average for 1991--2000, except the Madison River, which is for station 06042500 (Madison River near Three Forks, for 1942--1949 which are the most recent calendar years available.
Source: USGS, 2004

Figure 3.4-1 is a hydrograph for each of the four USGS gaging stations used in Table 3.4-2 above. It is derived from daily average data for calendar years 1994-2003, except for the Madison River, where the most recent data were used (1942-1949 from station number 06042500, “Madison River near Three Forks”).

Figure 3.4-1 Hydrograph for Missouri River Headwaters



Source: USGS, 2004.

Several inferences can be made from the hydrographs and corresponding drainage areas. First, the size and timing of the annual peak flows are indicative of snowmelt-dominated mountain streams. Also noteworthy is the hydrograph for the Jefferson River, which goes virtually dry at the end of the irrigation season, even though its drainage area is almost four times larger than the Madison River's and five times larger than the Gallatin River's. Section 3.7, Fisheries and Aquatics, contains additional information on area streams.

Surface Water Quality

The water quality of the study region is influenced by many factors. Because of geothermal activity in the Madison River headwaters and at other locations in the study region, some tributaries naturally contribute chemical compounds and elevated temperatures that exceed state and federal water quality standards. In addition, there is evidence that irrigation with Madison River water, which has high levels of arsenic, leads to concentration of arsenic in some aquifers along the river but reduced levels in others (Sonderegger and Sholes, 1988). Surface return flows and drains from irrigation, septic systems, and storm water all contribute water of variable quality to area streams seasonally, continually, or as a result of storm events. Consequently, water quality can vary significantly over short distances and times.

A number of streams within the study area are on the state 303(d) list of streams with impaired functionality, although some are on the list primarily because there are not enough data to demonstrate their functionality. The 303(d) list developed through the EPA's efforts to improve water quality beyond what could be achieved solely by reducing point-source or "end-of-pipe" contaminant sources. Established under the federal Clean Water Act, Section 303, the program establishes TMDLs, or Total Maximum Daily Loads, as a calculation of the maximum amount of

a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Standards are based on identified beneficial uses for each water body, such as drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. Table 3.4-3 lists ten of the streams closest to the Trident plant and their beneficial use support status. The table is from the DEQ Environet database as queried on through NRIS. Probable causes of impairment vary widely, but the most frequently listed are dewatering, flow alteration, and riparian degradation. Agriculture is listed as a probable source of impairment in most cases. For the Madison, Jefferson, and Missouri rivers, as well as Willow Creek, metals are listed as a probable cause of impairment and abandoned mining and associated activities as a probable source. For the Jefferson River, Madison River, and Willow Creek, thermal modification from low flows also is listed as a probable cause of impairment.

Table 3.4-3 Area Streams of the Montana 303(d) List

Water Body		Beneficial Uses[1]					
Number	**Name**	**Agriculture**	**Aquatic Life Support**	**Cold Water Fishery - Trout**	**Drinking Water Supply**	**Industrial**	**Primary Contact (Recreation)**
MT41F001_010	Madison R (45.8 mi)	F	P	P	NS	F	F
MT41G001_010	Jefferson R (83.6 mi)	F	NS	NS	NS	P	P
MT41G002_080	Willow Cr (17.6 mi)	F	NS	F	F	F	P
MT41H001_010	Gallatin R (50.5 mi)	F	P	NS	F	P	NS
MT41H002_010	Camp Cr (26.9 mi)	F	P	P	F	F	P
MT41H003_020	East Gallatin R (14.6 mi)	NA	NA	NA	NA	NA	NA
MT41H003_100	Dry Cr (16.21 mi)	F	P	P	F	F	NS
MT41I001_011	Missouri R (21 mi) headwaters to Toston Dam	NA	NA	NA	NA	NA	NA
MT41I002_120	Sixteenmile Cr (46.6 mi)	NA	NA	NA	NA	NA	NA
MT41I001_012	Missouri R (24.4 mi) Toston Dam to Canyon Ferry Reservoir	F	P	P	NS	P	F

- Note: [1]Key to Table:
- F=Fully Supporting T=Threatened P=Partial
  NS=Not Supporting NA=Not Assessed
- Source: DEQ, 2004

Table 3.4-3 demonstrates both a broad range of lost or reduced functionality in area rivers and an insufficient quantity of information about the extent and sources of the contamination. Placement of a stream on the 303(d) list, or the presence of contamination in a stream, does not lessen water quality standards applicable to the stream; in fact, listing on the 303(d) list triggers a process designed to improve water quality and restore beneficial uses wherever possible.

MFWP includes Canyon Ferry Reservoir and Willow Creek Reservoir in its Fish Consumption Advisory due to mercury levels in fish tissue from those water bodies (MFWP, 2004). PCBs were not detected in fish from either reservoir.

One method of determining where a contaminant is entering a stream is to sample water quality both upstream and downstream of suspected sources. If the suspected source is contributing a pollutant to the stream, then concentrations (and/or loads) of that compound should be higher downstream of the source than they are upstream.

The Madison River and upper Missouri River have been rigorously tested for water quality because the headwaters of the Madison River in Yellowstone National Park includes a number of geothermal springs that contribute exceptionally high quantities of arsenic, making it unusable as a drinking water source without treatment to remove the toxic element. The current Montana human health standard for arsenic in surface water is 10 micrograms/liter (µg/L) (DEQ, 2006). In the lower Madison River, arsenic concentrations range from 27 to 113 µg/L. As far downstream as the Helena Valley, arsenic concentrations in the Missouri River range from 1.1 to 22 µg/L (USGS, 2001a). Table 3.4-4 lists arsenic concentrations and loads at several stations from the Madison River below Ennis Lake to the Missouri River at Virgelle (below Great Falls). On three occasions that represent high, base, and low flow conditions, samples were taken at multiple stations at close time intervals to determine if arsenic was being added to, or removed from (i.e., through sedimentation), the water through this area that includes the Holcim Trident plant location. Several of these studies included samples from the Gallatin and Jefferson rivers that showed arsenic to be below detectable limits on those rivers, thus removing them as significant sources of additional arsenic. In the study cited (USGS, 1997), dissolved arsenic concentrations were compared to total recoverable arsenic, which includes both dissolved arsenic and arsenic on suspended sediment. The two values were very similar, indicating little or no arsenic is adsorbing onto sediment or settling out of the water column.

Arsenic load was determined by multiplying concentration by discharge, then applying conversion factors to obtain pounds/day. While arsenic load increased below the Trident plant for one sample series, it was reduced in the two other series. Therefore, the results are inconclusive relative to the Holcim cement plant as a source of arsenic into the Missouri River and its tributaries.

Table 3.4-4 Arsenic Concentrations and Loads on the Madison and Upper Missouri Rivers

Source: USGS, 1997; DEQ, 2006

Station ID	Station Name	Sample Date	Discharge (cfs)	Concentration (µg/L)	Load (lb/day)
6041000	Madison River below Ennis Lake	5/28/93	6,290	59	1,997
6042600	Madison River @ Three Forks	5/28/93	5,650	57	1,733
6054500	Missouri River @ Toston	5/25/93	13,300	18	1,289
6041000	Madison River below Ennis Lake	8/18/93	1,830	56	552
6042600	Madison River @ Three Forks	8/19/93	1,700	54	494
6054500	Missouri River @ Toston	8/23/93	5,930	20	638
6041000	Madison River below Ennis Lake	8/24/94	1,120	94	567
6041500	Madison River near Norris	8/24/94	1,150	98	607
6042600	Madison River @ Three Forks	8/25/94	960	95	491
6054500	Missouri River @ Toston	8/16/94	1,200	65	420
	DEQ-7 Acute Aquatic Standard		High Flow	340	
	DEQ-7 Chronic Aquatic Standard		Base Flow	150	
	DEQ-7 Bioconcentration Factor		Low Flow	44	

Additional water quality data are available for streams within the 10- and 50-km (6.21- and 31.06-mile) radii of the Trident plant; however, no other agency sample series includes sites above and below the Holcim cement plant that would provide meaningful data on the plant as a potential source of surface water contamination.

Another way to characterize water quality is over time, to determine if there are any temporal trends. Table 3.4-5 summarizes USGS water quality samples from the Toston station, approximately 14 miles downstream of the Trident plant. Toston is one of the few stations with over thirty years of water quality sampling on record. Here again, the sampling has been sporadic and, for the reasons described below, inconclusive.

For many of the constituents studied, the majority of samples were below the detection limit for the sampling methodology used, and those limits have changed over time as analytical instruments and methods improved. With cadmium, for example, the detection limit for filtered samples (dissolved) was 2 µg/L before August 1979, when the detection limit improved to 1 µg/L. The detection limit for unfiltered (total recoverable) cadmium was 20 µg/L before December 1978, then 2 µg/L until July 1982, 1 µg/L until November 1999, and since then has been 0.1 µg/L. For this reason, samples below the detection limit were not valued at half the detection limit, as is sometimes the practice, when calculating averages or computing trends. In other words, the averages in the table do not take into account the many samples that were below the detection limit. The standard for cadmium is based on an unfiltered sample (which should

equal dissolved plus suspended), but, perhaps because of the high detection limit for the laboratory method used, the unfiltered samples were all within the standard while the filtered samples (dissolved only) were higher.

Table 3.4-5 Water Quality at Toston

		Samples		Sample Dates		Concentration (µg/L)		
Compound	**Medium[1]**	**Total**	**<Detect**	**First**	**Last**	**Max**	**Average**	**State Limit[2]**
Arsenic	unf	122	0	3/16/73	5/21/02	69	31.0	150
Arsenic	filt	135	0	3/16/73	8/7/95	100	36.9	
Arsenic	susp	31	9	12/26/73	9/8/82	20	4.1	
Cadmium	unf	46	39	3/16/73	5/21/02	0	0.0	0.097[3]
Cadmium	filt	74	71	3/16/73	8/20/91	3	2.0	
Cadmium	susp	24	10	12/26/73	2/24/81	10	2.5	
Chromium	unf	47	33	8/23/73	5/21/02	30	6.5	11[4]
Chromium	filt	76	65	8/23/73	8/20/91	10	2.0	
Chromium	susp	31	0	12/26/73	8/25/81	20	4.0	
Copper	unf	42	12	3/16/73	5/21/02	190	30.4	2.85[3]
Copper	filt	74	48	3/16/73	8/20/91	10	3.5	
Copper	susp	35	1	12/26/73	5/25/81	190	20.8	
Lead	unf	47	44	3/16/73	5/21/02	5	3.0	0.545[3]
Lead	filt	75	61	3/16/73	8/20/91	6	1.4	
Lead	susp	30	10	12/26/73	7/17/82	95	13.2	
Manganese	unf	39	0	3/16/73	9/8/82	270	60.8	--
Manganese	filt	86	34	3/16/73	8/16/91	30	11.8	
Manganese	susp	34	0	1/26/73	9/8/82	240	53.8	
Mercury	unf	40	28	3/16/73	9/18/82	1.5	0.20	0.91
Mercury	filt	76	62	3/16/73	8/20/91	0.4	0.08	
Mercury	susp	33	0	12/26/73	11/5/81	1.5	0.08	
Zinc	unf	47	7	3/16/73	5/2/02	90	29.9	37[3]
Zinc	filt	74	49	3/16/73	8/20/91	40	11.2	
Zinc	susp	30	3	12/26/73	9/8/82	80	23.3	

- Notes: [1]unf = unfiltered water; filt = filtered water (dissolved); susp = suspended sediment;
[2]Aquatic Standard, Chronic (DEQ DEQ-7, 2006)
[3] @25 mg/L hardness
[4] for hexavalent Cr (VI), 27.7 for Cr (III) @ 25 mg/L hardness (samples were not separated by valence)
Source: USGS, 2004

Consequently, the data are insufficient to determine more than the following:

1) There are no discernible trends over time; and

2) Water quality in the Missouri River at Toston occasionally exceeds the chronic aquatic standards (DEQ, 2004) for chromium, copper, lead, mercury, zinc, and probably cadmium.

Whether these high concentrations are due to natural or anthropogenic sources cannot be determined from available data.

The table points out one other aspect of the data, which is whether the constituent is primarily in a dissolved state or mobilized as suspended sediment (through sorption onto sediment particles). With arsenic, for example, average concentrations in filtered and unfiltered samples are very similar, while concentrations on suspended sediment are low. This suggests that arsenic remains dissolved in the water column. For manganese, on the other hand, concentrations in the unfiltered water and suspended sediment are similar, while concentrations in the filtered water samples are substantially lower. This suggests that manganese tends to sorb onto larger particles, which, in turn, are more likely to settle into the stream bed.

Groundwater

The study area is a mountainous region with deep deposits of valley fill or alluvium. Although groundwater may be found in useful quantities in bedrock crevices, it is the river valley alluvium that provides the most reliable, productive aquifer in the study area. Table 3.4-6 shows well depths and yields for 353 wells within 10 km (6.21 miles) of the Trident plant that are listed in the MBMG Ground Water Information Center (GWIC) database. Records with incomplete or no data were removed. The table shows highly productive alluvial aquifers at shallow and relatively shallow depths in the immediate area.

Table 3.4-6 GWIC Database Wells within 10 Kilometers of Trident, Montana

Depth (in feet)	Total No. of Wells	Yield (gpm)				Maximum Yield (Well depth in feet)
		1-25	26-50	51-100	>100	
1-50	151	51	50	16	34	3 @ 1,000 (21)
51-100	84	58	22	3	1	280 (62)
101-200	75	46	13	5	11	600 (135)
201-300	28	16	3	3	4	700 (300)
301-400	11	4	1	3	3	1500 (320)
>400	4	4	0	0	0	25 (520)

Source: MBMG, 2004

Monitoring of groundwater around the Trident plant has been conducted semi-annually since 1992, according to an unpublished report by Bison Engineering. Results presented in the monitoring report show no trends in water quality for the period of record. Depth to water in the monitoring wells near the facility ranged from 4.75 feet to 13 feet below ground surface in 2000 (Bison 2001).

Water Use

Table 3.4-7 lists public water supplies within 10 km (6.21 miles) of Trident. "Class" in the table refers to community public water systems (C), non-community non-transient systems (primarily for residents, industrial use, or employees) (P), and non-community transient systems (primarily for visitors/customers) (N). Within 50 km (31.06 miles) of Trident, NRIS lists 165 additional

permits, including one from surface water (Golden Sunlight Mine), two blended sources, and four purchased from municipal water systems.

Table 3.4-7 Public Water Supply

Class	Source	Name	City	Resident Population[1]	Nonresident Population[1]
N	Groundwater	Land O Magic Supper Club	Manhattan	0	80
P	Groundwater	Holnam Incorporated Cement	Three Forks	17	85
P	Groundwater	Holnam Incorporated Cement	Three Forks	17	85
N	Groundwater	Headwaters Picnic Area	Bozeman	0	75
N	Groundwater	Headwaters Campground	Bozeman	0	50
C	Groundwater	Three Forks, City of	Three Forks	1,800	30
C	Groundwater	Three Forks, City of	Three Forks	1,800	30
C	Groundwater	Three Forks, City of	Three Forks	1,800	30
C	Groundwater	Three Forks, City of	Three Forks	1,800	30
C	Groundwater	Three Forks, City of	Three Forks	1,800	30
N	Groundwater	Steer Inn Restaurant & Lounge	Three Forks	50	0
N	Groundwater	Town Pump #0350	Three Forks	0	100
N	Groundwater	Town Pump #0350	Three Forks	0	100
P	Groundwater	Wheat Montana Bakery	Three Forks	90	90
N	Groundwater	Prairie Schooner	Three Forks	0	50
N	Groundwater	Sharky's Travel Shop	Three Forks	0	200
N	Groundwater	Fort Three Forks Motel and RV Park	Three Forks	0	40

Note: [1]resident systems are for people living or working at the facility, while non-resident population is the general public
Source: NRIS, 2004

Within 8 km (4.97 miles) of Trident, the Montana Department of Natural Resources and Conservation (DNRC) water rights database shows 328 records. Table 3.4-8 summarizes the database by use category and maximum flow rate. The table is only an approximation of water use because the database may list the same right several times for different uses, repeating the quantity. Duplicates for the same use were eliminated from the database prior to summary for the table. The table indicates that the highest water use by volume is for fish and wildlife, with irrigation a distant second, and all other uses minor by comparison.

Table 3.4-8 Water Use

Use Type	Number of Rights	Maximum Flow (cfs)
Commercial	12	27.9
Domestic	95	4.4
Fish & Wildlife	20	12,507.6
Industrial	8	4.1
Institutional	1	0.07
Irrigation	88	353.2
Lawn & Garden	24	1.1
Municipal	3	1.0
Stock	77	3.3

Source: NRIS, 2004

Table 3.4-9 shows Holcim's water rights for the Trident plant. All of these are designated as industrial use, in Gallatin County, and groundwater source rights. Note that one cfs equals 448.8 gpm.

Table 3.4-9 Holcim's Water Rights

Water Right	Priority Date	Rate (gpm)	Volume (acre feet/year)	Well Depth (feet)
41I 19251400	4/27/67	150	200	37
41I 19251500	1/31/72	425	5	31
41I 4971700	3/21/83	600	150	No Data
41I 19251600	6/1/08	150	200	20
41I 19251700	6/1/30	250	200	130
41I 19251800	6/1/30	150	200	20

Source: NRIS, 2004

3.5 Wildlife

The 50-km (31.06-mile) study area is inhabited by several wildlife species, including birds and big game. Several special status species are also found within the area, including mammals, insects, birds, and bird rookeries. Special status plant species are discussed in Section 3.6 and special status aquatic species are discussed in Section 3.7.

The EPA protocol for screening-level ecological risk assessments describes the complexity of ecological systems and habitats as follows (EPA, 1999):

> *Information obtained during exposure setting characterization should be used to develop one or more habitat-specific food web(s) that represent communities and guilds of receptors potentially exposed to emissions from facility sources. Food webs are interlocking patterns of food chains, which are the straight-line transfer of energy from a food source (e.g., plants) to a series of organisms feeding on the source or on other organisms feeding on the food source (Odum 1971). While energy and, therefore, transfer of a compound in a food chain, is not always linear, it is assumed in this guidance that energy and, thus, compounds, are always transferred to a higher trophic level. The importance of a food chain as an exposure pathway primarily depends on receptor dietary habits, the receptors in the food chain, and other factors including bioavailability and depuration of the compound evaluated.*

The EPA protocol recommends the following steps:

- Identify habitats surrounding the facility (e.g., freshwater aquatic, forest, shortgrass prairie, agricultural/cropland, scrub/shrub, etc);
- Identify media (e.g. soil, sediment, water) for each habitat-specific food web;
- Identify trophic levels that include (at a minimum) producers, primary consumers, secondary consumers, and carnivores;
- Divide guilds (e.g., herbivorous mammals, omnivorous birds, as per EPA, 1999) into classes and communities; and

Identify major dietary interactions (e.g., lynx feeding on hares feeding on vegetation).
Each of the habitat-types listed in the first bullet above is present within the 50-km (31.06-mile) study area. Shortgrass prairie and agriculture dominate the 10-km (6.21-mile) study area surrounding the facility.

An exhaustive analysis of the wildlife within the study area, including fisheries and terrestrial and avian species, is outside the scope of this EIS. Media and species representative of the primary habitats and guilds are used in this EIS as a basis for judging impacts.

3.5.1 Inventory Methods

Data on habitat for wildlife species were downloaded from Natural Resource Information System (NRIS, 2004) unless otherwise stated. Special status species information was procured from the Montana Natural Heritage Program (MNHP; Miller, 2004).

Vegetation cover types are reflective of general wildlife habitat conditions within the study area. Cover types are described in Section 3.6.2. Locations of species and habitats are described below in Section 3.5.2.

3.5.2 Inventory Results

General Species

Several common species occur in the vicinity of the Trident facility including bald eagle, cottontail rabbit, great blue heron, red fox, and red-tailed hawk (DEQ, 2003; Bison Engineering, 2002). Table 3.5-1 identifies species distributions and/or suitable habitat that occur within the 10-km (6.21-mile) and 50-km (31.06-mile) study areas.

Table 3.5-1 Species and Habitat within the Two Study Areas

Species	10-km Area	50-km Area
Antelope *Antilocapra americana*	Range directly adjacent to plant	Winter range and general distribution – majority of west half is mapped habitat 12,308 acres of winter range 793,780 acres of overall distribution**
Bald eagle *Haliaeetus leucocephalus*	Nests reported close to Holcim site (DEQ, 2003). Two bald eagle nests are located just south of Clarkston and approximately 8 to 9 km north of the plant.	Several nests along Missouri, Gallatin and Jefferson rivers.
Bighorn sheep *Ovis canadensis*	None	Winter range and general distribution 39,536 acres of winter range west of Townsend 12,108 acres of overall distribution**
Black bear *Ursus americanus*	Covers entire area	Covers entire area 1,937,790 acres of overall distribution
Cottontail rabbit *Sylvilagus* spp	Found in area of Holcim/Trident (Bison Engineering, 2002)	Suspected to occur
Elk *Cervus elaphus*	None	Much habitat, including crucial winter and summer range areas* 58,521 acres of crucial winter range 40,969 acres of crucial summer range all acres occurring in the northern 1/3 of the 50-km radius 877,020 acres of overall distribution**
Great blue heron *Ardea herodias*	Rookeries reported near Holcim site (Miller, 2004).	Rookeries along Missouri, Gallatin, and west of Willow Creek Reservoir (Miller , 2004)
Hungarian partridge *Perdix perdix*	Covers almost entire area	Covers approximately half of study area 1,007,324 acres of overall distribution
Moose *Alces alces*	Some winter range (Nov 15 to Mar 1)	Winter range and general distribution 72,731 acres of winter range on the eastern and southern periphery of the 50-km radius 212,101 acres of overall distribution**
Mountain goat *Oreamnos americanus*	None	Winter range and general distribution 13,148 acres of winter range along the Bridger Range (east) and on the southern periphery of the 50-km radius
Mule deer *Odocoileus hemionus*	Winter range and general distribution surrounds plant	Winter range and general distribution 1,159,082 acres of winter range throughout the 50-km radius 786,847 acres of overall distribution**
Pheasant habitat *Phasianus colchicus*	Habitat surrounding plant	Overall and fair habitat 246,885 acres
Red fox *Vulpes vulpes*	Reported as occurring at Holcim site (DEQ, 2003)	Assume distribution through wider area
Red-tailed hawk *Buteo jamaicensis*	Reported occurring at Holcim site (DEQ, 2003)	Assume distribution through wider area
Ruffed grouse *Bonasa umbellus*	None	494,071 acres of overall distribution

Table 3.5-1 Species and Habitat within the Two Study Areas (Cont.)

Species	10-km Area	50-km Area
Sage grouse *Centrocercus urophasianus*	Distribution directly east of plant	Distribution directly east of plant 57,162 acres of overall distribution
Sharp-tailed grouse *Tympanuchus phasianellus*	Range inside 10-km boundary	Large amount of range 1,081,514 acres of overall distribution
Turkey *Meleagris gallopavo*	Occupied and potential habitat	Occupied and potential habitat 111,185 acres of occupied habitat 19,380 acres of potential habitat
Whitetail deer *Odocoileus virginianus*	Habitat surrounds plant	Habitat abundant and roughly paralleling water bodies 954,168 acres of overall distribution

- Note: *Elk crucial winter range is defined as that area where 90 percent of the population concentrates during heavy snowpack or low temperatures.
- **Overall distribution in this table refers to distribution as outside seasonal distribution. Seasonal distribution is not applicable or recorded for several species in the MTFWP databases - including ruffed grouse.
- Source: NRIS, 2004; Miller, 2004

Special Status Species

The MNHP database was queried for special status species that occur within the 50-km (31.06-mile) study area of the Trident facility (Miller, 2004). Special status species occurring within the 10-km (6.21-mile) zone having protection under the Endangered Species Act (ESA) include bald eagle (Threatened) and lynx (Threatened); they are discussed in detail in the following sections. In addition to special status species, the MNHP report contained locations of great blue heron and double-crested cormorant rookeries. The rookeries are important to local breeding populations of these species. All Species of Concern occurring within the 50-km (31.06-mile) study area are identified in Table 3.5-2.

Table 3.5-2 Special Status Species Occurring Within 50 km of Facility

Common Name	Scientific Name	Global Rank	State Rank	USFWS Status	USFS Status	BLM Status
American white pelican	*Pelecanus erythrorhynchos*	G3	S3B	None	None	None
Bald eagle (nests)	*Haliaeetus leucocephalus*	G4	S3B, S3N	LT	Sensitive	Special Status
Caspian tern	*Sterna caspia*	G5	S2B	None	None	None
Flammulated owl	*Otus flammeolus*	G4	S3B	None	Sensitive	Special Status
Forster's tern	*Sterna forsteri*	G5	S2B	None	None	None
Great blue heron (rookeries)	*Ardea herodias*	NA	SNR	None	None	None
Northern goshawk	*Accipiter gentilis*	G5	S3S4	None	Sensitive	Special Status
Agapetus caddisfly	*Agapetus montanus*	G2	S2	None	None	None
Brown's microcylloepus riffle beetle	*Microcylloepus browni*	G1	S1	None	None	None
Last best place damselfly	*Enallagma optimolocus*	G1G3	S1S3	None	None	None
Stonefly	*Isocapnia crinita*	GU	S2	None	None	None
Warm spring zaitzevian riffle beetle	*Zaitzevia thermae*	G1	S1	C	None	None
Western pondhawk	*Erythemis collocata*	G5	S1S1	None	None	None
Fringed myotis	*Myotis thysanodes*	G4G5	S3	None	None	None
Lynx	*Lynx canadensis*	G5	S3	LT	None	None
Townsend's big-eared bat	*Corynorhinus townsendii*	G4	S2S3	None	None	Special Status

- Notes: **C** Candidate – Those taxa for which sufficient information on biological status and threats exists to propose to list them as threatened or endangered. Their consideration in environmental planning and partnerships is encouraged; however, none of the substantive or procedural provisions of the ESA apply to candidate species.
- **G1 S1** At high risk because of extremely limited and potentially declining numbers, extent, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
- **G2 S2** At risk because of very limited and potentially declining numbers, extent, and/or habitat, making it vulnerable to global extinction or extirpation in the state.
- **G3 S3** Potentially at risk because of limited and potentially declining numbers, extent, and/or habitat, even though it may be abundant in some areas.
- **G4 S4** Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.
- **G5 S5** Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
- **B** Breeding – Rank refers to the breeding population of the species in Montana.
- **N** Nonbreeding – Rank refers to the non-breeding population of the species in Montana.
- **NA** Not applicable. Item is a biological feature rather than species with an assigned ranking (Miller, 2004)
- **LT** Listed threatened – Any species likely to become an endangered species within the fore seeable future throughout all or a significant portion of its range (16 U.S.C. 1532 (20)).
- **PT** Proposed threatened – Any species for which a proposed rule has been published in the Federal Register to list the species as threatened.
- **SNR** State not ranked. Listed as a biological feature rather than a species designation (Miller, 2004).
- Source: Adapted from MNHP, 2004; Miller, 2004

Canada Lynx

The Canada lynx is listed as Threatened by the USFWS pursuant to the ESA (16 U.S.C. 1531 *et seq.*). The description of habitat within this section discusses lynx habitat generally. It is not necessarily a description of lynx habitat available inside the study area. Lynx habitat exists at the southern end of the 50-km study zone, just east of Norris, Montana. The majority of this habitat is forested, grassland, and shrubland cover.

Habitat Description

Canada lynx habitat principally includes subalpine and boreal forest types, including subalpine fir *(Abies lasiocarpa)*, Engelmann spruce *(Picea engelmannii)*, lodgepole pine *(Pinus contorta)*, and aspen *(Populus tremuloides)* forests (Koehler and Aubry, 1994; Stinson, 2001). Douglas-fir *(Pseudotsuga menziesii)* and grand fir *(Abies grandis)* are considered to be lynx habitat only where they occur within a matrix of subalpine fir habitat types.

Lynx require two distinct forest structural types. The species habitat requirements include both early successional forests that support high densities of snowshoe hare (principal prey) and late successional forests for denning and the rearing of young (Butts, 1992; Koehler and Aubry, 1994). Studies have shown that snowshoe hare populations reach their highest densities in stands that provide dense cover and large quantities of browse that is accessible above the snow pack (Koehler and Britell, 1990). These characteristics typically occur in conifer stands that are between 15 and 30 years old (Koehler and Aubry, 1994). High quality denning habitat is limited to mature forest, which provides the coarse woody debris needed for thermal cover and protection for the young (Koehler and Aubry, 1994). Other important features of denning habitat include minimal human disturbance, proximity to early succession foraging habitat, and access to travel corridors to permit females to move kittens to alternative den sites and gain suitable access to prey (Koehler and Aubry, 1994).

Behavior

Lynx utilize areas with high canopy closure to move between denning and foraging habitats (Koehler, 1990). Although they will cross openings over 100 meters (328 ft) in width, they do not forage in these areas (Koehler, 1990). Female lynx typically remain near their mothers' home ranges, while juvenile males tend to disperse (Koehler and Aubry, 1994). When prey is scarce, even resident adult lynx may move long distances. Record distances include 688 and 438 miles (1,100 and 700 km) in the Yukon (Ward and Krebs, 1985) and 203 miles (325 km) in western Montana (Brainerd, 1985).

Canada lynx prefer to forage in early seral forests that contain an abundance of snowshoe hares (Koehler and Aubry, 1994). Although they utilize other small prey, such as grouse and squirrels, snowshoe hares comprise the bulk of the lynx diet (Brand et al., 1976).

Bald Eagle

The bald eagle is listed as Threatened under the ESA, and is a Species of Special Concern in Montana. The bald eagle also receives protection under the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668d) and the Migratory Bird Treaty Act (16 U.S.C. 703-711). MNHP identified 13 bald eagle records within the 50-km (31.06-mile) study zone. These occurrences

are generally clustered along the Missouri River between Toston and Townsend and the lower end of the Jefferson River, with a few dispersed occurrences along the Madison River.

Habitat Description

Bald eagles are closely associated with open water and adjacent riparian and upland habitats. Bald eagles nest in large, dominant trees, usually within line of sight of a body of water. Eagles typically build large stick nests in the fork of a tree and occasionally on cliffs (Montana Bald Eagle Working Group [MBEWG], 1991; Rodrick and Milner, 1991; Groves et al., 1997). Outside the breeding season they are often associated with concentrations of prey such as spawning fish or migratory waterfowl. Proximity to water, availability of prey, and availability of large trees for nesting, perching, and roosting are the three most important habitat requisites (MBEWG, 1991; Rodrick and Milner, 1991; Groves et al., 1997).

Behavior

Bald eagles usually forage from perches in large trees or snags, taking live fish or waterfowl. They also feed on small rodents and carrion. Eagles roost in large trees, and in winter often prefer to roost in conifers and other sheltered sites.

Human disturbance can affect eagles during both the nesting and wintering seasons. Eagles may react to people passing near nests, perches, or roosts, whether on foot or in a vehicle. They may also react to loud noises and activities such as operation of heavy equipment. If the disturbance occurs frequently it can disrupt nesting, feeding, or roosting activities and force eagles to desert a nesting territory or move to less desirable habitats (Knight and Knight, 1984; Magaddino, 1989; Stalmaster, 1987). Disruption of winter feeding can stress birds at a vulnerable time of year. In open areas, 50 percent of wintering eagles flush at human activities within 500 feet (152 m), but 98 percent tolerate activity at 1,000 feet (305 m) (Stalmaster and Newman, 1978). The birds' response depends on the timing, intensity, and frequency of disturbance. Reaction to disturbance also depends on the sensitivity of individual eagles and their habituation. Some individual birds display more tolerance than others, particularly to existing levels of activity (Stalmaster, 1987). The ultimate measures of sensitivity to and tolerance of disturbance are nest success, productivity, and survival (MBEWG, 1991).

Distribution and Population Trend

Breeding and wintering bald eagles occur along reservoirs, lakes, and major rivers. Several bald eagle nest territories exist in the project area along I-90. Breeding and wintering bald eagles live along rivers, reservoirs, lakes, and sloughs adjacent to the project area. In the vicinity of the project area, bald eagles nest and winter on the Missouri, Jefferson, and Madison rivers (Miller, 2004). Populations in Montana have steadily increased over the last two decades, reflecting the national trend, and the nesting population in the state is one of the most productive in the western United States (USDI, 1994). The number of known nesting pairs in Montana increased from 12 in 1978 to 265 in 1999 (MFWP, 2000; Flath, 2000).

3.6 Vegetation and Wetlands

This section describes vegetation cover and farmland within both the 10-km (6.21-mile) and 50-km (31.06-mile) study areas.

3.6.1 Inventory Methods

A three-tiered analysis was used to document existing vegetative and wetland conditions in the study area. Landscape use/life form classifications were first mapped to show broad scale landscape use patterns that can dramatically influence vegetation composition and structure. Cover types were then more narrowly defined into vegetation type, by species and life form. Third, a search of Montana Species of Special Concern was used to locate records of sensitive species (MNHP, 2004). Three such species have been identified within the 10-km (6.21-mile) study area: Ute ladies' tresses (*Spiranthes diluvialis*), annual Indian paintbrush (*Castilleja exilis*), and mealy primrose (*Primula incana*). Discussion of these species and their habitats is provided in Section 3.6.2.3.

3.6.2 Inventory Results

Vegetation

The data for vegetative land cover types were obtained from the Montana Gap Analysis Program (MT-GAP). MT-GAP data were created from Landsat TM imagery and ancillary biophysical data. The various cover types are quantified in Table 3.6-1, followed by detailed descriptions of the seven most common cover types.

Table 3.6-1 Percentage of Land Cover Type in 50-km (31.06 miles) Study Area

Land Cover Type	Percentage
Urban or Developed Lands	**0.43**
Agricultural	**19.10**
Agricultural Lands – Dry	9.62
Agricultural Lands – Irrigated	9.48
Grasslands	**46.85**
Altered Herbaceous	0.04
Very Low Cover Grasslands	7.71
Low/Moderate Cover Grasslands	35.28
Moderate/High Cover Grasslands	1.83
Montane Parklands and Subalpine Meadows	2.00
Shrublands	**10.50**
Mixed Mesic Shrubs	1.02
Mixed Xeric Shrubs	0.20
Salt-Desert Shrub/Dry Salt Flats	0.03
Sagebrush	8.97
Mesic Shrub – Grassland Associations	0.21
Xeric Shrub – Grassland Associations	0.08
Forest Lands	**18.47**
Low Density Xeric Forest	0.53
Mixed Broadleaf Forest	0.89
Lodgepole Pine	1.87
Limber Pine	1.23
Ponderosa Pine	1.17
Douglas-fir	5.55
Rocky Mountain Juniper	1.02
Douglas-fir/Lodgepole Pine	0.71
Mixed Whitebark Pine Forest	0.17
Mixed Subalpine Forest	1.28
Mixed Xeric Forest	3.94
Mixed Broadleaf and Conifer Forest	0.11
Water	**0.48**
Riparian Types	**3.07**
Conifer Riparian	0.29
Broadleaf Riparian	0.49
Mixed Broadleaf and Conifer Riparian	0.09
Graminoid and Forb Riparian	0.80
Shrub Riparian	0.79
Mixed Riparian	0.61
Barren Lands	**1.09**
TOTAL	**100.00**

Source: Fisher et al., 1998

Low/Moderate Cover Grasslands (35.28 Percent of Study Area)

Low/moderate cover grasslands is the most common land cover type in the study area. This cover type is widely scattered throughout most of the study area except the Gallatin Valley where agricultural use is the dominant land cover type. Low/moderate cover grasslands are characterized as:

> *Grasslands with total grass cover from 20-70 percent. Dominated by short to medium height grasses and forbs. Grasslands with production ranges from 300 to 1,800 lb/ac. Includes rangelands and non-irrigated pastures (Fisher et al., 1998).*

The most common native species found on these low to moderate cover grasslands include:

- Arrowleaf balsamroot (*Balsamorhiza sagittata*)
- Bluebunch wheatgrass (*Pseudoroegneria spicata*)
- Blue grama (*Bouteloua gracilis*)
- Sedge species (*Carex* spp.)
- Green needlegrass (*Nassella viridula*)
- Idaho fescue (*Festuca idahoensis*)
- Lupine (*Lupinus* spp.)
- Needle and thread grass (*Hesperostipa comata*)
- Western wheatgrass (*Pascopyrum smithii*)

Agricultural Lands/Dry (9.62 Percent of Study Area)

Typical species on dry agricultural lands include hay and other crops. This cover type is non-irrigated. The majority of dry agricultural lands in the study area occur in the Gallatin Valley. Agricultural land in Montana can be generally categorized as cropland, hay meadow, irrigated hay meadow, or tame pasture. Cereal grain crops are grown on cropland. Hay meadows usually occur on low-lying, gentle topography such as floodplains or terraces where mowing equipment can operate. These sites are mostly seeded to alfalfa and/or introduced grasses such as smooth brome and timothy. Irrigated hay meadows are similar to hay meadows; however, they are artificially supplied with water seasonally. Tame pasture generally designates areas of introduced grasses that are moderately to heavily grazed and often contain a variety of weedy forb species, including noxious weeds in some areas.

Agricultural Lands/Irrigated (9.48 Percent of Study Area)

Organic farms are discussed in the Land Use section of this chapter.
The majority of irrigated agricultural lands are in the Gallatin Valley and their species composition consists of crop species and hay. See discussion above for a complete description of agricultural land in Montana.

Sagebrush (8.97 Percent of Study Area)

The sagebrush cover type is widely scattered throughout most of the study area, except for the Gallatin Valley. The MT-GAP Analysis Land Cover Atlas describes this cover type as:

> *Shrublands dominated by sagebrush (Artemisia spp.) with 20 to 80 percent cover. Associated grass and forb species include bluebunch wheatgrass, blue grama, Idaho fescue, and western wheatgrass (Fisher et al., 1998).*

Common sagebrush species in the region include:

- Basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*)
- Black sagebrush (*Artemisia nova*)

Very Low Cover Grasslands (7.71 Percent of Study Area)

This cover type is distributed throughout the study area. Semi-desert grasslands, with total grass cover from 10 to 30 percent cover, are areas dominated by short grasses and forbs and typically have a high amount of bare soil (20 to 60 percent cover). Grasslands have production ranges of 50 to 300 pounds per acre (lb/ac) and are usually associated with alkaline soils and/or disturbed sites (Fisher et al., 1998).
Common species include:

- Blue grama
- Clubmoss (*Selaginella densa*)
- Hood’s phlox (*Phlox hoodii*)
- Missouri goldenrod (*Solidago missouriensis*)
- Prairie June grass (*Koeleria pyramidata*)
- Sandberg bluegrass (*Poa secunda*)
- Sun sedge (*Carex heliophila*)
- Threadleaf sedge (*Carex filifolia*)

Douglas-fir (5.55 Percent of Study Area)

Douglas-fir *(Pseudotsuga menziesii)* is the most common conifer throughout the study area and is distributed in the forested stringers. Associated shrub species include ninebark *(Physocarpus malvaceus)*, shiny-leaf spiraea *(Spiraea betulifolia)*, and snowberry *(Symphoricarpos* spp.).

Associated grass and forb species include bluebunch wheatgrass, Idaho fescue, and pinegrass *(Calamagrostis rubescens)* (Fisher et al., 1998).

Mixed Xeric Forest (3.94 Percent of Study Area)

The mixed xeric forest cover type is widely distributed throughout. Xeric is an ecological term used to define dry conditions. This type is predominately Douglas-fir and ponderosa pine (*Pinus ponderosa*) stands with components of Rocky Mountain juniper *(Juniperus scopularum)*. Associated shrub species include ninebark, shiny-leaf spirea, and snowberry (Fisher et al., 1998).

Wetlands

National Wetland Inventory (NWI) data were downloaded from the NRIS database. NWI data were developed through a combination of aerial photography interpretation, soils series analysis, and field checking. Mapping is incomplete in the study area and has only occurred in the southeastern section in the Gallatin Valley and portions of the Madison Valley. Based on this incomplete mapping, the NWI identifies 155 acres of wetlands within 10 km (6.21 miles) of Trident and 5,849 acres within the 50-km (31.06-mile) zone.

Streamside Types

The majority of wetland and riparian sites in the study area occur at streams and rivers. Many of the intermittent and perennial streams also support a fringe of freshwater emergent vegetation wetland (Cowardin et. al., 1979). Wetlands and riparian areas adjacent to streams and rivers support a range of vegetation types. Streamside types occur all along the Gallatin, Madison, Missouri, Jefferson, and Boulder rivers.

Springs, Seeps, Marshes, and Wet Meadows

Springs, seeps, marshes, and wet meadows are wetlands, as classified by Cowardin et al. (1979). All of these types are widely distributed throughout the study area. Most of these areas are dominated by herbaceous vegetation, although shrub and forest dominated sites are also common. These sites are primarily slope wetlands as classified by Brinson (1993), with a few sites classified as depressional wetlands with no drainage outlet.

The Nebraska sedge (*Carex nebrascensis*) and bluejoint reedgrass (*Calamagrostis canadensis*) types are the most common herbaceous types. Other common herbaceous types include beaked sedge (*Carex rostrata*), panicled bulrush (*Scirpus microcarpus*), redtop (*Agrostis gigantea*), arrowleaf groundsel (*Senecio triangularis*), common cattail (*Typha* spp.), reed canarygrass (*Phalaris arundinacea*), and slender sedge (*Carex gracilior*).

Alder types, both mountain alder (*Alnus viridis* ssp. *crispa*) and Sitka alder (*Alnus viridis* ssp. *sinuata*) are the most common shrub types at springs and seeps. Less common shrub types include redosier dogwood (*Cornus sericea*), and Drummond willow (*Salix drummondiana*)/beaked sedge.

Species of Concern

There are several Montana Plant Species of Special Concern within the 50-km (31.06-mile) study area (Table 3.6-2). Ute ladies' tresses, a plant listed as Threatened under the ESA, has been recorded within the 10-km (6.21-mile) study boundary. Plant species and habitat descriptions of plants within the 10-km boundary are noted below in this section.
In Montana, the rarity of a plant species is classified under several federal and state designations. Species of Special Concern and their ranking system are described as follows:

> *Taxa are evaluated and ranked by the Heritage Program on the basis of their global (range-wide) status and their state-wide status according to a standardized procedure used by all Natural Heritage Programs. These ranks are used to determine protection and data collection priorities and are revised as new information becomes available.*
>
> *The international network of Natural Heritage Programs employs a standardized ranking system to denote global (G – range-wide) and state (S) status. Species are assigned numeric ranks ranging from 1 (critically imperiled) to 5 (demonstrably secure), reflecting the relative degree to which they are "at-risk" (MNHP, 2004).*

For example, annual Indian paintbrush is ranked G5 S2. Globally the species is secure, while in Montana it is imperiled because of rarity, or because of other factors making it vulnerable to extirpation.

Table 3.6-2 Montana Plant Species of Special Concern inside 50-km (31.06 miles) Study Area

Species	Global Rank	State Rank	USFWS Status	USFS Status	BLM Status	Proximity
Annual Indian paintbrush *Castilleja exilis*	G5	S2	None	None	None	Inside 10 km
Austin's knotweed *Polygonum douglasii* ssp. *austinae*	G5T4	S2	None	Sensitive	Sensitive	Inside 50 km
Dwarf purple monkey flower *Mimulus nanus*	G5	S1	None	None	None	Inside 50 km
Hall's rush *Juncus hallii*	G4G5	S2	None	Sensitive	Sensitive	Inside 50 km
High-arctic buttercup *Ranunculus hyperboreus*	G5	S1	None	None	None	Inside 50 km
Long-styled thistle *Cirsium longistylum*	G2	S2	None	Sensitive	Sensitive	Inside 50 km
Many-ribbed sedge *Carex multicostata*	G5	S1	None	None	Watch	Inside 50 km
Mealy primrose *Primula incana*	G4G5	S2	None	None	Watch	Inside 10 km
Slender wedgegrass *Sphenopholis intermedia*	G5	S1	None	None	Watch	Inside 50 km
Small dropseed *Sporobolus neglectus*	G5	S1	None	None	Watch	Inside 50 km
Small yellow lady's-slipper *Cypripedium parviflorum*	G5	S3	None	Sensitive	Watch	Inside 50 km
Tapertip onion *Allium acuminatum*	G5	S1	None	Sensitive	Sensitive	Inside 50 km
Ute ladies' tresses *Spiranthes diluvialis*	G2	S2	Listed Threatened	None	Watch	Inside 10 km

- Notes: Global Rank/State Rank:
- **G1 S1** At high risk because of extremely limited and potentially declining numbers, extent, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
- **G2 S2** At risk because of very limited and potentially declining numbers, extent, and/or habitat, making it vulnerable to global extinction or extirpation in the state.
- **G3 S3** Potentially at risk because of limited and potentially declining numbers, extent, and/or habitat, even though it may be abundant in some areas.
- **G4 S4** Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.
- **G5 S5** Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.
- Source: MTNHP is part of the Natural Heritage Program network, which uses a standardized set of rankings. MTNHP, 2004

Ute ladies' tresses

Ute ladies' tresses is one of three plant species listed as Threatened by the USFWS in Montana, and the only one found in the study area. This species is a perennial orchid, which blooms in August to early September. Ute ladies' tresses occurs in meandered wetlands and swales in broad, open valleys (MNHP, 2000) and in broadleaf forests and graminoid and shrub-dominated riparian areas, at elevations of 4,050 to 5,080 feet (1,234 to 1,548 m) (MNHP, 2000). It is the only orchid species in Montana that is restricted to grassland. Among plants with a Rocky Mountain distribution, it is among the few species confined to low elevations (Heidel, 1998). Two locations have been recorded to the southwest of Three Forks and another is found west of Manhattan (see Map-8). One location has been recorded along the Missouri River between Townsend and Toston. This species is also found in restricted areas in the interior western United States.
Ute ladies' tresses occur in Montana in highly restricted microhabitats in shallow, meandered wetlands. Within these wetlands, the species lives in small pockets of sparse, highly calcareous meadow (Heidel, 1998).

Soils are a critical determining factor in assessing potential habitat for this species, especially in its Montana occurrences. The MNHP has identified and mapped four distinct soil types that correlate highly with Ute ladies' tresses habitat in Montana. The four soil types are: the Neen and Villy soil series in the seven western occurrences (in Beaverhead, Jefferson, and Madison counties), and the Fairway and the Saypo series among the three eastern occurrences (Gallatin County).

Soils supporting Ute ladies' tresses populations are generally high in nutrients and organic matter; however, they are low in phosphorus when compared to average values for agricultural soils.

The MNHP has documented 11 occurrences of this species in Montana (MNHP, 2000). Ute ladies' tresses was listed as a Threatened plant species under the Endangered Species Act in 1992 (57 FR 2053). Ute ladies' tresses colonizes early successional riparian habitat. A localized decline may result from continued changes in stream channel position and encroachment of later successional vegetation. Its habitat in Montana is not directly associated with riverine succession. Rather, the occurrences are along shallow wetlands set back from rivers in open, broad valleys. In these areas, the vegetation is usually sparse and short when compared to the vegetation in surrounding wetlands

Annual Indian paintbrush

Annual Indian paintbrush is listed as a Species of Special Concern with MNHP. A record of the species covers a large part of the 10-km (6.21-mile) study area. This is because the MNHP reports some occurrences at a broad scale to discourage plant enthusiasts from visiting these sites if they are particularly sensitive or on private land. It is possible this plant is very near the Holcim/Trident cement plant. Annual Indian paintbrush is found primarily in alkaline marshes and meadows, mostly at lower elevations, throughout the intermountain region from central Washington and eastern Oregon to southern Montana and western Wyoming, south to northwestern New Mexico, northern Arizona, Nevada, and adjacent California. Its flowering period is from late June through September.

Mealy primrose

Mealy primrose is listed with MNHP as a Species of Special Concern. A record covers a large part of the 10-km (6.21–mile) study area, in the same area as annual Indian paintbrush. Mealy primrose is found on stream banks and in moist meadows in the Rocky Mountains from Colorado and Utah to northern Canada. It is also known to occur in southeast Idaho. Its flowering period is from May to July.

3.7 Fisheries and Aquatics

Both cold water and warm water fisheries are found within the 50-km (31.06-mile) study area. Warm water fisheries are located primarily in Canyon Ferry Lake on the northern border of the 50-km (31.06-mile) study area. Major fish-bearing streams in the area include the Missouri, Gallatin, Jefferson, and Madison rivers. Several small tributaries are found within the 10-km (6.21-mile) study area, but none are known to be fish bearing streams.

3.7.1 Inventory Methods

Montana Fisheries Information System (MFISH) (MFISH, 2004) and biologist interviews were used to obtain fish presence, summarized in Section 3.7.2 below.

3.7.2 Inventory Results

Fish

The study area receives high sport fishing use. Consumption of fish opens a potential exposure pathway of toxins to humans. Table 3.7-1 documents fish presence on major stream reaches within the study area. Westslope cutthroat trout occur only on tributaries to these sampled reaches and are therefore not represented in this table.

Three Montana Fish Species of Special Concern are known to occur within the 50-km (31.06-mile) study area: arctic grayling, westslope cutthroat trout, and Yellowstone cutthroat trout (MNHP, 2004; Byorth, 2004; AFS, 2004). Arctic grayling reintroduction is occurring in the area around Three Forks and is further discussed in the section on the Missouri River.

Missouri River

In the study area, the Missouri River reach is classified as having “outstanding” to “high” Fisheries Resource Values by MFWP (MFISH, 2004). The river is considered periodically dewatered (MFISH, 2004). A passage barrier exists at Toston Dam which separates distinct populations. Stocked rainbow trout from Canyon Ferry Reservoir migrate as far upstream as Toston Dam (Spoon, 2004).

Table 3.7-1 Fish Presence on Major Stream Reaches within Study Area

Species Name	Missouri River Above Toston Dam	Missouri River Canyon Ferry Lake to Toston Dam	Gallatin River	Jefferson River	Madison River
Arctic grayling *(Thymallus arcticus montanus)**			Rare		Rare
Brook trout *(Salvelinus fontinalis)*			Rare		Rare
Brown trout *(Salmo trutta)*	Common	Common	Abundant	Common	Rare to abundant
Burbot *(Lota lota)*	Rare	Rare		Rare	
Common carp *(Cyprinus carpio)*	Abundant	Abundant		Common	Rare
Flathead chub *(Hybopsis gracilis)*	Rare	Rare		Rare	
Largemouth bass *(Micropterus salmoides)*	Rare	Rare			
Longnose dace *(Rhinichthys cataractae)*	Common	Common	Rare	Common	Abundant
Longnose sucker *(Catostomus catostomus)*	Common	Common	Common	Common	Abundant
Mottled sculpin *(Cottus bairdi)*	Common	Common	Abundant to common	Common	Abundant
Mountain sucker *(Catostomus platyrhynchus)*	Rare	Rare	Rare	Rare	Rare
Mountain whitefish *(Prosopium williamsoni)*	Common	Common	Abundant	Abundant	Common
Northern pike *(Esox lucius)*		Rare			
Rainbow Trout *(Oncorhynchus mykiss)*	Common	Common	Abundant	Rare	Rare
Redside shiner *(Richardsonius balteatus)*				Rare	
Stonecat *(Noturus flavus)*	Rare	Rare			Rare
Utah chub *(Gila atraria)*					Rare
White sucker *(Catostomus commersoni*)	Common	Common	Common	Common	Abundant
Yellowstone cutthroat trout *(Oncorhynchus clarki bouvieri)**			Rare		Rare

- Note: * Montana Species of Special Concern (MNHP, 2004)
- Source: MFISH, 2004; Byorth, 2004

The key sport fish in this river is brown trout. The biggest limiting factors for fish habitat are water flow and temperature. Long lasting drought has had substantial impacts to trout populations, resulting in numbers today that are approximately one-third of what they were in the mid-1980s (Spoon, 2004).

MFISH was used to gather data for the Missouri River within Broadwater and Gallatin counties. Data are reported for two reaches of the stream: above Toston Dam (river mile [rm] 2,295.6 to 2,312.4) and above the inlet of Canyon Ferry Lake up to the Toston Dam (rm 2,251.4 to

2,295.5). Surveys in 1999 reported fish occurrence from rm 2282.8 to 2285.2 from Toston to Crow Creek as follows: 28 brown trout, 5 suckers, 2 common carp, and approximately 260 mountain whitefish (MFISH, 2004). Surveys immediately downstream from the proposed project site (rm 2305.5 to 2310.2) found 86 rainbow trout [1979], 33 brown trout [1982], and 419 trout (species unnamed) [1976] (MFISH, 2004). Brown trout populations have decreased substantially since the 1970s below the Toston dam. Despite downward trends in brown trout, this stream is still widely regarded by MFWP as a strong fishery. A survey in the immediate area of the Holcim/Trident plant in 2001 was conducted from the Gallatin River confluence approximately 2.5 miles downstream (Spoon, 2004). This survey documented 620 mountain whitefish, 108 white suckers, 39 brown trout, and 54 rainbow trout. This was a boat, electro-shock survey; therefore, it did not produce sculpin or dace. No arctic grayling were found during the 66 minutes of sampling.

The confluence area at Three Forks has been the site of an arctic grayling reintroduction effort within the last five years. This reintroduction has been only partially successful, most likely due to environmental stress induced by low flows and water temperature (Spoon, 2004). The only success with grayling introduction to date has been in the lower Gallatin River.

Crow Creek

Flowing out of the Elkhorn Mountains, located west of Toston and Townsend, Crow Creek is classified as having "substantial" Fisheries Resource Value. From rm 0.0 to rm 14.9 is considered an area of "chronic dewatering" (MFISH, 2004). Fish species present include: Brook trout, brown trout, mottled sculpin, mountain whitefish, and rainbow trout. Several tributaries to Crow Creek contain westslope cutthroat trout and are the focus points of cutthroat population restoration by MFWP (Spoon, 2004).

Canyon Ferry Lake

The tip of this 33,534-acre reservoir is on the northern edge of the 50-km (31.06-mile) study area. The Missouri River flows into it. Though managed as trout water, MFWP does not assign a Fisheries Resource Value to this water body. The lake receives a high amount of fishing pressure with 106,810 days of angling use for the year of 2002 (MFISH, 2004). An aggressive stocking program exists for Canyon Ferry Lake. Numbers of rainbow trout and brown trout have declined rapidly since the mid-1980s probably as a result of planted walleye, which have increased substantially from the same time period.

Gallatin River

The Gallatin River is an approximately 100-mile blue ribbon trout stream and provides an economic benefit for the region. Fisheries resource values of "high" to "outstanding" exist from rm 0 to 85.4 and "limited" from 85.5 upward.

Total numbers of trout have been fairly stable over the past 20 years, although there was a population slump in the mid-1990s. A light infection of whirling disease exists in the Gallatin drainage (MWDTF, 2004). MFWP has not seen huge population declines as a result of whirling disease, but deformities are obvious (Byorth, 2004). The main limiting factor to quality fish habitat is water temperature (Byorth, 2004). Dewatering is also a concern. The MFWP considers the lower 34 miles to suffer from chronic dewatering and rm 34 to rm 43 to suffer from periodic dewatering associated with irrigation and an extended drought. Arctic grayling

reintroduction has occurred here, and at least one grayling was found during routine surveys in the mid-1990s (Byorth, 2004). Of the Missouri, Gallatin, Jefferson, and Madison rivers, the Gallatin is the only one where there has been a measured success of the arctic grayling introduction program (Spoon, 2004).

Cottonwood Creek

This 11-mile tributary of the Gallatin River, is located inside the study area, and is considered to be of limited fisheries value with no fish species present, although it is managed by MFWP as "trout water" (MFISH, 2004). It is not considered by MFWP to be dewatered or suffering from low or non-existent flows.

Rey Creek

Rey Creek is located within the 10-km study zone. This stream is assumed by MFWP to contain brown trout and rainbow trout, is managed as trout water, and is classified as having "substantial" Fisheries Resource Value (MFISH, 2004). It is not considered by MFWP to be dewatered.

Jefferson River

The Jefferson River is classified as having "substantial" to "high" Fisheries Resource Values. From rm 0.0 to 74.09 it is considered by MFWP to be chronically dewatered (MFISH, 2004). Fish counts have declined from approximately 600 per mile to 200 per mile in the past 20 years. Fourteen of the last 20 years have had drastically low flows and high temperatures creating stressful conditions for fisheries (Spoon, 2004).

Boulder River

Boulder River, located approximately 20 miles west of the Trident facility, is classified by MFISH as containing "substantial" to "moderate" Fisheries Resource Values. It is not considered by MFWP to be dewatered. It is known to contain: brook trout, brown trout, longnose dace, longnose sucker, mottled sculpin, mountain whitefish, rainbow trout, and white sucker.

Willow Creek Reservoir

No Fisheries Resource Value is assigned to Willow Creek Reservoir by the MFWP, but it does contain brown trout, longnose sucker, rainbow trout, and white sucker.

Madison River

The Madison River is managed as "trout water" by MFWP and is classified as having "outstanding" Resource Fisheries Value. It is not considered by MFWP to be dewatered. Rainbow trout numbers in the Madison River plummeted substantially from late 1970 to 1994. Whirling disease was diagnosed in 1994, and studies suggest it has had a severe biological impact on fisheries in the Madison (Roulson, 2002). Although whirling disease is mainly evident downstream of Ennis, it is not currently at levels inducing catastrophic losses (Byorth, 2004). The Madison fishery provides an economic benefit to the region by drawing anglers from out of state. A user survey in the mid-90s reported 90 percent of anglers to be non-residents.

Special Status Species

No special status fish are documented to occur within 10 km (6.21 miles) of the Holcim facility. Byorth (2004) reported finding an arctic grayling in the Gallatin River, but the location was not noted. The three special status species identified in Table 3.7-2 below are believed to occur within the 50-km (31.06-mile) radius. MFWP is currently focusing westslope cutthroat restoration efforts in the Elkhorn Mountain Range. Restoration is currently occurring in Little Keiser and Eureka Creeks, both of which are in the Crow Creek drainage (Spoon, 2004).

Table 3.7-2 Special Status Fish Species within 50-km (31.06 miles) study area

Common Name	Scientific Name	Global Rank	State Rank	USFWS Status	USFS Status	BLM status	Proximity
Yellowstone cutthroat trout	*Oncorhynchus clarki bouvieri*	G4T2	S2	None	None	Special Status	Shields River Drainage on the far west side
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	G4T3	S2	None	None	Special Status	Hall Creek (tributary to Crow Creek) in northwest corner
Arctic grayling	*Thymallus arcticus montanus*	G5T1Q	S1	C	None	Special Status	Gallatin River (Byorth, 2004)

- Notes: Global Rank/State Rank:
- **G1 S1** At high risk because of extremely limited and potentially declining numbers, extent, and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.
- **G2 S2** At risk because of very limited and potentially declining numbers, extent, and/or habitat, making it vulnerable to global extinction or extirpation in the state.
- **G3 S3** Potentially at risk because of limited and potentially declining numbers, extent, and/or habitat, even though it may be abundant in some areas.
- **G4 S4** Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.
- **G5 S5** Common, widespread, and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.

Source: MFWP, 2004

Aquatic Invertebrates

Aquatic communities in rivers and streams are composed of assemblages of plants and animals reflective of their environment. The environment that shapes these assemblages consists of the chemical composition of the water column, physical stream environment, and interactions of the aquatic and plant communities. Table 3.7-3 shows that there were 20 to 33 aquatic invertebrate species at sites sampled in rivers connected to the project study area when sampled in 2000 and 2001. Biotic indices suggest that the upper Gallatin River has better aquatic habitats than the Jefferson or Missouri River sample sites. Lower biotic indices reflecting higher water quality were calculated from sampling in the Jefferson River in 1978 (Oswald, 1979), suggesting some deterioration of water quality may have occurred since that time. The composition of the

communities sampled reflects impairments of these waters, as certain species can increase or decrease as specific natural or impaired components of their habitats change.
Aquatic macroinvertebrates include insects that spend most of their life cycles as larva living in stream sediments. The most common are mayflies (*Ephemeroptera* spp.), stoneflies (*Plecoptera* spp.), and caddis flies (*Tricoptera* spp.).

Table 3.7-3 Aquatic Macroinvertebrate Communities in Rivers Associated with Project Area

Location	Site ID	Taxa Richness*	EPT Richness**	Biotic Index	Impairment
Jefferson R near Three Forks	M08JEFFR01	32	16	4.81	Warm water and sediments
Missouri R near Toston	M09MISSR01	26	9	4.97	Warm water and nutrients
Gallatin R	G1 Downstream of Yellowstone National Park (YNP)	26	16	1.57	Unimpaired
Gallatin R	G2 below Taylors Fork	20	14	1.12	Unimpaired
Gallatin R	G3 Above West Fork	26	16	2.00	Unimpaired
Gallatin R	G4 below West Fork	27	14	2.77	Unimpaired
Gallatin R	G5 Greek Cr CG	32	17	2.70	Elevated Nutrients
Gallatin R	G6 Above Spanish Cr	33	18	2.50	Unimpaired
Gallatin R Near Logan	M05GALLR01	28	13	4.50	Warm water and sediment

- Notes: * Total Taxa present, ** Taxa present of the orders Ephemeroptera, Plecoptera, and Tricoptera
- Source: Bollman, 2001, 2002a, 2002b, 2002c, 2002d

Headwaters of streams connected to the project study area have invertebrate populations reflective of unimpaired watersheds, and downstream populations indicate increasing stream impairments as they approach the project area. These impairments have been attributed to increased water temperature, sediments and nutrient enrichment (Bollman, 2001, 2002a, 2002b, 2002c, 2002d; Oswald, 1979).

3.8 Land Use

This section characterizes land use in a 50-km (31.06-mile) study area surrounding the plant. More specific discussion of land use is provided for the 10-km (6.21-mile) study area surrounding the plant, where warranted.

The 50-km (31.06-mile) study area falls within the counties of Gallatin, Broadwater, Jefferson, Madison, and Meagher. Private land dominates the study area. Public land is owned and managed by the Bureau of Land Management (BLM), Bureau of Reclamation (BOR), United States Forest Service (USFS), United States Department of Agriculture (USDA), Montana University System, Montana Department of Transportation (MDT), MFWP, DNRC, and various local governments.

Nearby population centers include the incorporated areas of Bozeman, Belgrade, Manhattan, Three Forks (Gallatin County), Townsend (Broadwater County), and Whitehall (Jefferson County). Prominent land uses include commercial, industrial, public and institutional, farms and ranches, rural residences, communication sites, airport/airstrips, roads and highways, utility rights-of-way for electrical power lines and telephone lines, oil and gas production and pipelines, mining, rangeland and agriculture (crops and livestock), and recreation.

3.8.1 Inventory Methods

The land use inventory was conducted between January and April of 2004. Existing data, containing land cover and uses, were obtained from the NRIS GIS. The NRIS acts as a clearinghouse for GIS databases. National Aerial Photograph Program (NAPP) 1: 20,000 scale 1995 black and white aerial photography was also used. Federal, state, and local land resource agencies were also contacted during this time to update official information and to solicit further input. The information collected within the study areas was organized into three inventory categories: (1) Land Ownership/Jurisdiction, (2) Land Use, and (3) Parks, Recreation, and Preservation Areas.

3.8.2 Inventory Results

Land Ownership and Jurisdiction

The 50-km (31.06-mile) study area covers 1,929,652 acres. Table 3.8-1 shows land surface ownership/jurisdiction in acres for the study area. The incorporated areas within the study area are the cities of Bozeman, Belgrade, Three Forks, and Townsend, and the towns of Manhattan and Whitehall.

Table 3.8-1 Land Ownership and Jurisdiction – 50-km (31.06 miles) Study Area

Land Ownership/Jurisdiction	Total Acres
Bureau of Land Management	118,882
Bureau of Reclamation	2,900
U.S. Forest Service	193,704
United States Department of Agriculture	32
Montana University System	1,774
Montana Department of Transportation	23
Montana Fish, Wildlife & Parks	6,015
Montana Department of Natural Resources and Conservation	89,852
Private	1,516,470
TOTAL	**1,929,652**

Source: Montana State Library/NRIS

Land surface ownership/jurisdiction within the 10-km (6.21-mile) study area is shown in Table 3.8-2. The only incorporated area within this study area is the City of Three Forks.

Table 3.8-2 Land Ownership and Jurisdiction – 10-km (6.21 miles) Study Area

Land Ownership/Jurisdiction	Total Acres
Bureau of Land Management	4,469
Montana Department of Transportation	23
Montana Fish, Wildlife & Parks	952
Montana Department of Natural Resources and Conservation	4,174
Private	67,351
TOTAL	**76,969**

Source: Montana State Library/NRIS

Existing Land Uses

Agriculture

Agriculture (crops and livestock) is a predominant land use within the 50-km (31.06-mile) study area. Agricultural land refers to pasture and irrigated and dry croplands. Some Montana state trust land is also leased for agricultural purposes.

Crops grown at any one location in the study area vary, and occasionally lands are fallow for water conservation and weed control. Specific irrigation methods (center pivot, wheel line, and flood) also vary depending on soil properties, topography, and cost. Principle crops include wheat, barley, and hay. Data on the crop types grown in the study area were obtained from the Montana Department of Agriculture.

Livestock includes cattle (beef and milk cows), sheep and lambs, and one large confinement swine operation. Livestock and crop sales are a large source of cash receipts by agricultural producers. Milking operations also provide an important percentage of revenue of all dairy sales in Montana.

Irrigated and non-irrigated 2002 harvested acreage for all crops in the five study area counties is found in Table 3.8-3. Information on crops planted and harvested for these counties in 2002 is provided in Table 3.8-4. The number of head of livestock for these counties in 2002 is also provided in Table 3.8-5.

Table 3.8-3 2002 County Estimates – Irrigated and Non-irrigated Harvested Crop Acreage

County	Irrigated Harvested Acres	Non-irrigated Harvested Acres
Gallatin	82,610	70,800
Broadwater	34,120	34,000
Jefferson	19,700	4,700
Madison	74,310	9,400
Meagher	37,100	26,700

Source: 2003 Montana Agricultural Statistics, 2001-2002 County Estimates

Table 3.8-4 2002 County Estimates – Crops Planted and Harvested

	Gallatin		Broadwater		Jefferson		Madison		Meagher	
Crop	**Acres Planted**	**Acres Harvested**	**Acres Planted**	**Acres Harvested**	**Acres Planted**	**Acres Harvested**	**Acres Planted**	**Acres Harvested**	**Acres Planted**	**Acres Harvested**
Winter Wheat	20,500	19,000	9,500	9,000	2,700	2,500	2,300	2,300	6,500	6,000
Durum Wheat	*	*	*	*	*	*	*	*	*	*
Other Spring Wheat	28,500	28,000	29,000	26,300	*	*	5,300	4,900	3,700	3,600
Barley	36,700	35,400	8,700	7,600	*	*	7,600	3,000	14,300	11,000
Oats	1,400	1,000	*	*	*	*	2,700	700	1,600	800
Corn	1,000	----	*	----	*	----	*	----	*	----
Corn, For Grain	----	*	----	*	----	*	----	*	----	*
Corn, For Silage	----	900	----	*	----	*	----	*	----	*
Potatoes	4,030	4,010	1,050	1,020	*	*	*	*	*	*
Sugar Beets	*	*	*	*	*	*	*	*	*	*
Dry Beans	*	*	900	700	*	*	*	*	*	*
All Hay	----	66,000	----	24,000	----	20,000	----	72,500	----	42,000
All Hay, Alfalfa	----	53,000	----	19,000	----	11,000	----	46,500	----	23,000
All Hay, All Other	----	13,000	----	5,000	----	9,000	----	26,000	----	19,000

Note: * Either zero or insufficient data for publication
Source: 2003 Montana Agricultural Statistics, 2001-2002 County Estimates

Table 3.8-5 2002 County Estimates –Number of Head of Livestock

Livestock	Gallatin	Broadwater	Jefferson	Madison	Meagher
All Cattle & Calves	53,000	20,600	21,000	74,000	53,000
All Cattle & Calves, Beef Cows & Heifers (1)	22,900	12,700	12,600	47,000	29,800
All Cattle & Calves, Milk Cows & Heifers(1)	5,900	**	**	**	**
All Sheep & Lambs	5,100	**	**	6,300	5,700
Hogs & Pigs	**	**	**	**	**

Notes: (1) That have calved. ** Insufficient data for publication.
Source: 2003 Montana Agricultural Statistics, 2001-2002 County Estimate

High quality seed potato production occurs in the study area, especially in the Gallatin Valley. Gallatin County alone produces over $10 million worth of seed potatoes each year (2002 http://www.manhattanseedspuds.com/seed-potato-certification.asp).

Organic farming is limited. According to the USDA Economic Research Service, organic farming is one of the fastest growing segments of U.S. agriculture. Growth in retail sales has equaled 20 percent or more annually since 1990. Organic farming is a way of farming that avoids the use of synthetic chemicals and genetically modified organisms (GMOs) and follows the principles of sustainable agriculture. Methods of organic farming vary. Each farm develops its own organic production system, determined by factors like climate, crop selection, local regulations, and the preferences of the individual farmer. Organic farms share common goals and practices:

- No use of synthetic fertilizers or pesticides, and no GMOs;
- Protection of the soil from erosion, nutrient depletion, structural breakdown;
- Promotion of biodiversity (e.g., growing a variety of crops rather than a single crop);
- No drugs (e.g., antibiotics, hormones), and access to outdoor grazing, for livestock and poultry.

Organic certification is an accreditation process for producers of organic food and other organic agricultural products. In general, any business directly involved in food production can be certified, including seed suppliers, farmers, food processors, retailers and restaurants. The National Organic Program (NOP) was enacted as federal legislation in October 2002. It restricts the use of the term "organic" to certified organic producers. Producers who market less than $5,000 worth of organic products annually are not required to become certified, though they have the option of doing so. These operations must still adhere to the federal standards (NOP regulations) for organic production, product labeling, and handling.

Federal organic legislation defines three levels of organics. Products made entirely with certified organic ingredients and methods can be labeled "100 percent organic." Products with 95 percent organic ingredients can use the word "organic." Both may also display the USDA organic seal. A third category, containing a minimum of 70 percent organic ingredients, can be labeled "made with organic ingredients." In addition, products may also display the logo of the certification

body that approved them. Certification is handled by state agencies, non-profit organizations, and private entities that have been approved/accredited by the USDA.
Seven certified organic producers were identified within the study area. These producers are certified by the Montana Department of Agriculture and include: Springhill Garden, Beaver Lodge Farm, Gaia Gardens, Thirteen Mile Farm, Half Circle Ranch, Montana State University, and a producer near Toston.

Organic producers certified through Stellar Certification Services, Organic Crop Improvement Association (OCIA) International, and International Certification Services, Inc. were not identified in the study area, although additional organic producers may exist in the study area. An organic Community Supported Agriculture (CSA) fruit and vegetable farm was identified in the study area. CSAs support organic farming, permaculture and biodynamic farming methods for sustainable agriculture. The farm was located from the Organic Consumers Association's organic farm listing and is situated northeast of Busch, Montana. The farm is also listed by the Appropriate Technology Transfer for Rural Areas (ATTRA) National Sustainable Agriculture Information Service. ATTRA is the national sustainable agriculture information service operated by the National Center for Appropriate Technology under a grant from the Rural Business-Cooperative Service, U.S. Department of Agriculture. River View Organic Produce Farm was also identified in the study area and is listed by the ATTRA National Sustainable Agriculture Information Service. This farm is located approximately 22 miles northeast of Three Forks near Clarkston, Montana.

Land defined as "important farmland" (prime farmland, prime farmland if irrigated, and farmland of statewide importance) is located within the study area. Land is identified as being important farmland based on soil types. The Secretary of Agriculture determines which soil types are of high agricultural value and designates them as important farmland. This farmland is discussed in detail in Section 3.3.

Conservation Reserve Program (CRP) land was identified in all five of the counties located in the study area. The CRP is a voluntary program for agricultural landowners and operators, who receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible land. Participants enroll in CRP contracts for 10 to 15 years. The Commodity Credit Corporation (CCC), through the Farm Service Agency (FSA), administers the program with program support provided by a number of technical service providers including the Natural Resources Conservation Service (NRCS), Cooperative State Research, Education and Extension Service (CSREES), U.S. Forest Service, state forestry agencies, and local Soil and Water Conservation Districts.

Residential

Residential uses are present within the 50-km (31.06-mile) study area. Incorporated areas within the study area are the cities of Bozeman, Belgrade, Three Forks, and Townsend, and the towns of Manhattan and Whitehall. Other population centers include mobile home parks and subdivisions and large-lot residential development. Residences are dispersed throughout the study area, but are present in greater concentrations along major transportation routes.

Residential land use has been rapidly increasing in Gallatin County. One of the fastest growing areas in the state of Montana is located just west of Bozeman. According to the Gallatin County Growth Policy, from 1990 to 2000, Gallatin County's population increased by 34.4 percent, ranking Gallatin County the fifth largest Montana county, and the second fastest growing county. From 1970 to 2000, the Gallatin County population increased by over 35,000 individuals. The 2000 Census reported Gallatin County's population to be 67,831, representing an increase of over 17,000 since 1990. Projections show a similar increase over the next 10 years, with an additional 16,000 people for a total of 82,000. By the year 2030, the Gallatin County population is expected to be 116,000, representing a 30-year increase of nearly 50,000 people. In many cases, it has become more profitable to subdivide the land for housing rather than farm or ranch. The Growth Policy also states that from 1990 to 2000, the Gallatin County Commission gave final approval to 323 minor and major subdivisions, for a total of 31,144 lots. Continued development and subdivision activity is expected as the population growth continues in Gallatin County.

According to the Belgrade Area Plan, the Belgrade City-County Planning Jurisdiction has been one of the fastest growing areas in Montana in the past decade. Over 2000 subdivision lots have been approved in Belgrade and its 4.5 mile planning jurisdiction, since 1990. Within this area is a broad mixture of residential development, including site built homes and manufactured homes. The area east of the Gallatin River and north of Amsterdam Road is almost completely developed with subdivisions.

Three Forks is within the 10-km (6.21-mile) study area. Agriculture, tourism, and the manufacturing of talc and cement are the main industries in the area. One of the main attractions in Three Forks is the Headwaters Heritage Museum. According to Gallatin County GIS structures data, a farmstead is located approximately 3,770 feet south of the plant and a residence 7,250 feet south-southeast of the plant.

Public and Institutional

Schools, churches, post offices, fire stations, libraries, and water treatment and sewage disposal facilities generally are located in and around the incorporated areas study area.

One public high school (Three Forks High School), and two public primary/middle schools (Three Forks Elementary School and Three Forks 7-8 School) are located within the 10-km (6.21 miles) study area. A solid waste facility, maintained and operated by Gallatin County (Logan landfill), is also located within this study area.

Commercial and Industrial Uses

Most commercial and industrial development in the 50-km (31.06-mile) study area can be found in or around cities and towns or near the on/off ramps of Interstate 90.

Linear Features

Major linear features located within the study area include electrical transmission lines, a railroad and various roadways. NorthWestern Energy currently owns and operates several transmission lines ranging in voltage from 50 to 230 kilovolt (kV) within the study area. In addition, Montana Rail Link (MRL) leases railroad tracks from the Burlington Northern Santa Fe Railway. MRL is

a regional Class II railroad serving more than 100 stations in Montana, Idaho and Washington. The main railroad is situated in a major utility corridor containing Interstate 90, Montana Route 205 (frontage road) and the Trident-Belgrade 50 kV transmission line. Roads and highways include interstate highways, U.S. highways, state highways, and local roads.

Communication Facilities

Commercial microwave, cellular and radio towers are generally located throughout the study area.

Parks, Recreation, and Preservation Areas/Tourism

Parks, Recreation, and Preservation Areas

The 50-km (31.06-mile) study area contains a number of recreational opportunities that vary with seasonal changes. Spring and summer provide opportunities for fishing, hiking, photography, horseback riding, wildlife viewing, spring hunting, water sports (powered and non-powered), off-road vehicle activities, camping, picnicking, and touring (vehicle and bicycle). Winter brings the sports of skiing, snowshoeing, snowboarding, and snowmobiling.

There are three national forests in the study area: Beaverhead-Deerlodge, Helena, and Gallatin. These forests provide a variety of yearlong, outdoor recreation. The Lee Metcalf Wilderness in the Gallatin National Forest provides unique wilderness opportunities for hiking, horseback riding, camping, fishing, hunting, wildlife viewing, and photography. The Bridger Mountains National Recreational Trail (also in the Gallatin Forest), Lewis and Clark National Historic Trail, and Bear Trap National Recreation Trail provide opportunities for hiking, horseback riding, camping, fishing, hunting, wildlife viewing, and photography.

The BLM manages land in the study area. The majority of this land is not contiguous; it is fragmented and many times isolated by private holdings. Most of this land is managed for multiple use. Recreational opportunities include hiking, horseback riding, off-road vehicle travel, fishing, hunting, wildlife viewing, camping, picnicking, skiing, and snowshoeing. BLM recreation sites include Bear Trap Canyon and Toston Dam. The first BLM wilderness in the country, Bear Trap Canyon, comprises 6,000 acres within the Lee Metcalf Wilderness Area. Primary recreational activities in the wilderness include: camping, fishing, hiking, backpacking, whitewater rafting and kayaking. Toston Dam is comprised of two water-oriented recreation sites located immediately above and below Toston Dam on the Missouri River eleven miles upstream (south) from Townsend. There is space for five to ten campsites at each site. The two sites provide river access ramps for floaters and overnight camping. Wildlife observation opportunities exist for waterfowl, eagles, hawks, cormorants and pelicans. Motor boats can be used above the dam on the small reservoir.

BLM's Black Sage Wilderness Study Area (WSA) is about 7 miles north of Interstate 90, east of the Boulder River.

Two segments of the Madison River on BLM land (Powerhouse to N. Wilderness Boundary and N. Wilderness Boundary to Grey Cliff) within the study area have also been determined by the BLM to be suitable for inclusion into the National Wild and Scenic Rivers system. The

Powerhouse to N. Wilderness Boundary segment is classified as scenic, while the N. Wilderness boundary to Grey Cliff is classified as recreational.

There are four state parks within the study area that offer outdoor activities, Native American history and geological sites, wildlife preserves, water sports, photography, hiking, camping, and fishing. These parks are Madison Buffalo Jump State Park, Parker Homestead State Park, Lewis and Clark Caverns State Park, and Missouri Headwaters State Park. State wildlife management areas and fishing access sites are also found within the study area.

In addition, state-owned lands checkerboard the study area. Much of this land is surrounded by private or federal land. Recreational opportunities include hunting, fishing, wildlife viewing, hiking, snowmobiling, and skiing. Navigable waterways and islands owned by the state also provide additional recreational opportunities.

In 2002 Gallatin County purchased 100 acres of land between Bozeman and Belgrade to construct a 100 acre regional park. With the assistance of a local nonprofit group, Friends of Regional Parks (FORParks), the park is currently under construction. Once the park is finished, it will be equipped with two fishing ponds, an amphitheater and multipurpose ball fields.

Depending on the municipality, Bozeman, Belgrade, Three Forks, Townsend, Manhattan, and Whitehall offer museums, parks, baseball fields, rodeo grounds and fairgrounds, walking/hiking/bicycle trails, water sports, outdoor sports activities at schools, and other opportunities.

In addition to public lands, recreational opportunities exist on privately owned lands, including private campgrounds, resorts, and dude ranches. Activities such as hunting and backcountry trips also may be permitted on privately owned land with landowner consent. Recreational opportunities also arise on private lands as a result of Montana FWP actions, such as hunting opportunities through the block management program and conservation easements. Organizations such as the Montana Land Reliance, Gallatin Valley Land Trust, Nature Conservancy and Montana FWP hold conservation easements on private land in the study area.

The Three Forks of the Missouri National Historic Landmark, Lewis and Clark National Historic Trail, and Missouri Headwaters State Park are located within the 10-km (6.21-mile) study area.

The Three Forks of the Missouri National Historic Landmark was listed on the National Register of Historic Places in 1966. National Historic Landmarks are nationally significant historic places designated by the Secretary of the Interior because they possess exceptional value or quality in illustrating or interpreting the heritage of the United States. Boundaries have not been established for either the National Historic Landmark or National Register of Historic Places due to lack of landowner agreement and/or landowner objections (Wegman-French, 2004). Additional information on the National Historic Landmark is described below in Section 3.10.

The Lewis and Clark National Historic Trail is generally located along the Missouri River. The trail is part of the National Trails System and is administered by the U.S. Department of the Interior, National Park Service. National Historic Trails recognize prominent past routes of

exploration, migration, and military action and generally consist of remnant sites and trail segments and are not necessarily continuous. Although National Historic Trails are administered by federal agencies, land ownership is both public and private. Private landowners may voluntarily have the trail through their land certified; however, none have chosen to do so within the study area. In 2000, the Lewis and Clark National Historic Trail was included as a Millennium Trail.

The Missouri Headwaters State Park, managed by Montana FWP, comprises 530 acres and encompasses the confluence of the Jefferson, Madison, and Gallatin rivers. The Montana Primitive Park Act of 1993 established the park as a "Primitive Park" because of its unique and primarily undeveloped character. The park is also a Land and Water Conservation Fund site. This undeveloped park provides outdoor interpretive signs, picnic spots, short hiking trails (4.1 miles), and a small campground (23 sites). Visitors to the park in 2003 totaled 69,759, which made the park the sixth most visited park in the state park system. Visitation to the park has increased in the last few years and is expected to increase through 2004-2006. This increase will most likely be due to the Lewis and Clark Expedition Bicentennial (Shelton, 2004). A small extension (22-25 acres) of the park, towards the east-southeast, is possible in the future and is currently being discussed. The Headwaters Legacy Trail project will be completed by the spring of 2005. This trail project will provide a pedestrian corridor between Three Forks and the Missouri Headwaters State Park (Heagney, 2004 and 2005).

The Gallatin County Growth Policy includes a goal to *"provide adequate local services and public facilities"* and a policy to *"require development to comply with plans for parks, recreation, open space and trails."* To help accomplish this goal and policy, the Gallatin County Planning Board appointed a volunteer advisory committee to develop a comprehensive county trails plan. *The Gallatin County Trails Report and Plan* was adopted by the Commission as a part of the Growth Policy on January 3, 2002, by Resolution 2002-04. Further, Gallatin County intends to develop a comprehensive county park, recreation and open space plan, and upon completion, to amend the Growth Policy to adopt recommendations of the plan (Gallatin County Growth Policy). Some proposed trails and potential trail corridors were identified within 10 km (6.21 miles) of the plant from Gallatin Trails Advisory Committee maps. These maps indicated that the proposed trails and potential trail corridors were intended to illustrate only general connections between existing trails and do not define specific trail locations. Easements for these proposed trails and potential trail corridors currently have not been acquired and some of their locations may change (Scott, 2004).

Other recreational activities within this study area are dispersed and include hunting, fishing, swimming, boating, floating, golfing (Headwaters Public Golf Course), and wildlife viewing.

Tourism

Tourism is one of Montana's leading and fastest growing industries and is the second largest industry behind agriculture, generating $1.7 billion annually from nonresident visitors (Montana Tourism & Recreation Strategic Plan 2003-2007). In 2001, Montana hosted 9.6 million nonresident visitors, a 46 percent increase from 6.5 million visitors in 1990.

The 50-km (31.06-mile) study area is located in portions of three Montana tourism regions (Russell Country, Gold West Country, and Yellowstone Country). Each of these tourism regions has its own unique character and assets. Preliminary estimates show nonresident visitors spent over $1.8 billion in Montana in 2003, with a resulting economic impact to the state of $2.6 billion. Direct expenditures greater than $10 million occur in just 22 of Montana's 56 counties. Yellowstone County and Gallatin County receive the greatest number of dollars from nonresidents. Expenditures by travel region show that Glacier Country, Custer Country, and Yellowstone Country are the top three revenue-generating regions within the state. Three of five counties in Yellowstone Country receive 83 percent of all Yellowstone Country expenditures, with Gallatin County receiving 53 percent of that region's expenditures.

The study area has a number of highly valued areas for a wide range of recreation activities including hunting and fishing, rafting and canoeing, hiking and camping, and general recreation. These activities are engaged in by large numbers of both area residents and non-residents and can be seen as contributing to the area's economy. National and state data indicate that demand for both motorized and non-motorized recreation access will continue to increase.

The study area may also experience an increase in visitation numbers as a result of the Lewis and Clark Expedition Bicentennial (2003-2006).

The University of Montana Institute for Tourism and Recreation Research estimates that as many as 4-8 million additional nonresident tourists could visit Montana during the four-year period. These people are expected to visit sites and communities along the Lewis and Clark National Historic Trail, some of which are located in the study area.

3.9 Transportation and Public Services

This section describes the existing affected local and regional road networks and the existing traffic patterns and conditions in the vicinity of the Holcim Trident cement plant. Rail transportation is also discussed.

3.9.1 Inventory Methods

The transportation and public services inventory was conducted between January and April 2004. State, county, and local agencies were contacted during this time to update official information and to solicit further input.

3.9.2 Inventory Results

Transportation

Public roads throughout Gallatin County are divided into different categories for development and maintenance. MDT is responsible for maintenance of federal highways, and state primary and secondary highways. County roads are maintained by Gallatin County, and private property owner associations maintain subdivision roads.

Interstate 90, a principal arterial, is the primary east-west highway and provides access from the plant region to Bozeman and Billings to the east, and Butte and Missoula to the west; it passes

approximately four miles south of the plant. This route has multiple lanes with controlled access.

Montana Routes S-205 and S-286 are functionally classified by MDT as major collector roads and are placed on the Secondary Highway System. Montana Route S-205 generally runs east-west and parallels Interstate 90 to the north. Montana Route S-286 generally runs in a north-south direction. Both routes contain two paved lanes. Annual average daily traffic (ADT) volumes for Interstate 90 and Montana Routes S-205 and S-286 between 2001 and 2003 are shown in Table 3.9-1.

Table 3.9-1 Interstate 90, Montana Route S-205, and Montana Route S-286 Average Daily Traffic, 2001 through 2003

Route	Section Description	Traffic Type	Section Length (miles)	2001 ADT	2002 ADT	2003 ADT
Interstate 90	Between the East Three Forks Interchange at Junction P-13/S-205 and the Manhattan Interchange at Junction S-288/S-346	All Vehicles	10.343	11,330	11,770	12,280
		Commercial		1,982	2,059	2,087
Montana Route S-205	Between the Junction of Interstate 90 and P-13 and the Junction of S-286	All Vehicles	1.868	1,070	1,120	1,380
	Between Junction S-286 and the Manhattan incorporated boundary	All Vehicles	8.384	784	723	911
Montana Route S-286	Between Junction S-205 and the Junction of Local Road 239 at Trident	All Vehicles	3.948	525	660	790

Source: Montana Department of Transportation

In addition to the ADT data provided in Table 3.9-1, the MDT has conducted a Special Manual Class Count for Montana Routes S-205 and S-286. The Montana Route S-205 count was performed at Milepost 1, one mile east of the Three Forks Interchange on March 26, 2002, over a four hour time period. The results of the count revealed an overall (Lane 1 and Lane 2) usage rate of 5.7 percent for large trucks. The Montana Route S-286 route count was performed at Milepost 2, north of Montana Route S-205 on March 11, 2004, over a three hour time period.

The results of the count revealed an overall (Lane 1 and Lane 2) usage rate of 5.5 percent for large trucks.

Primary vehicle access to the plant site is via Interstate 90, Montana Route S-205, and Montana Route S-286. The plant site is also accessed from the southeast by Logan-Trident Road, a county gravel surfaced road. ADT volumes for Logan-Trident Road during 1986, 2001, and 2004 are shown in Table 3.9-2. In addition, Montana Route S-286 provides access to the Missouri Headwaters State Park.

Table 3.9-2 Logan-Trident Road Average Daily Traffic, 1986, 2001, and 2004

Date	Year	ADT	Location
NA	1986	164	Bridge over Gallatin River
NA	1986	66	West End
10/01 - 10/05	2001	380	50’ north of Frontage Road (Montana Route S-205)
5/24 – 5/27	2004	218	100’ south of Y
5/24 – 5/27	2004	192	100’ west of Y
5/24 –5/27	2004	274	2 miles north of Frontage Road (Montana Route S-205)
5/24 –5/27	2004	365	250’ north of Frontage Road (Montana Route S-205)

Note: NA=Not Available
Source: Gallatin County Road and Bridge Department

MRL operates a rail line in the plant vicinity. MRL also delivers coal to the plant and transports bulk cement product from the plant via a rail spur.

According to the MDT Statewide Transportation Program 2004-2006 and discussions with Butte District 2 staff, the Three Forks interchange is scheduled to be removed and replaced. Tentative plans indicate that a contract will be awarded for construction in February of 2007. The project was originally nominated as a safety project because of limited site distances on the ramps and structure (Christensen, 2004).

Public Services

This section addresses public services most likely to be directly affected by the project. The relevant services are police and fire protection, emergency medical, and hazardous waste response.

Gallatin County does not develop or maintain infrastructure for fire protection. Those areas of Gallatin County served by an organized fire protection entity, an individual fire district or fire service area, develop and maintain the infrastructure. Generally, that infrastructure includes fire stations and fire fighting equipment.

The relevant police department in Gallatin County for the plant is the Gallatin County Sheriff’s Department. The County Sheriff’s Department employs 40 officers, and has 36 police cars. There is an average of 2.5 cars on the road (one officer per car) 24 hours a day (Oberhofer, 2004).

The Gallatin County Department of Emergency Services is the primary responder to any hazardous spills within the county. They respond to hazardous materials requests by police departments or fire districts having jurisdiction in the location of any events. The Department also performs notifications as appropriate to the DEQ and/or the Disaster and Emergency Services Division (DES), Montana Department of Military Affairs. The county department also handles spills in Bozeman under a joint agreement between Gallatin County and the City of Bozeman. Parties that release hazardous substances are responsible for actual cleanup, generally through private cleanup companies.

The relevant fire districts are Belgrade, Manhattan, Three Forks, and Gallatin Gateway. All but Belgrade are volunteer departments. Belgrade has salaried firefighters and is staffed (Shagger, 2004).

In Broadwater County, police services are provided by the Broadwater County Sheriff's Department. The department employs seven full-time and six reserve officers. Between one and four Sheriff's vehicles are on patrol at any time. Primary response in case of fire would likely be the Three Forks Fire Department, as well as, the Toston Fire District. Emergency medical services in the area are provided by those organizations as well. The county has an emergency coordinator for dangerous materials events (Weidman, 2004).

3.10 Cultural Resources

Cultural resources are districts, sites, buildings, structures, landscapes, or objects that are important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For this document, cultural resources can be divided into three major categories: archaeological resources, architectural resources, and traditional cultural properties. Archaeological resources are locations where human activity has measurably altered the earth or left deposits of physical remains (e.g., stone tools, pottery, bottles). Architectural resources include standing buildings, dams, canals, bridges, and other man-made features. Traditional cultural properties are resources that are important for maintaining the community's cultural identity, practices, and beliefs. In Montana, traditional cultural properties are usually associated with modern Native American groups. The following sections describe the cultural resource investigation for the project site.

3.10.1 Inventory Methods

For the EIS, the affected environment for cultural resources is limited to the existing Holcim plant boundary. The project boundary is a brownfield site that has been in operation for close to 100 years. Limestone quarry activity has involved ground disturbance for many years and presents no issue to current archaeologic and architectural concerns. No expansion beyond the cement plant footprint would be required for the Proposed Action and therefore no ground disturbing activities would take place outside of the plant boundary. Installation of the equipment for the project would require the use of motor vehicles or other heavy equipment, which would travel on existing roads to the facility. Once the equipment is installed, a conveyor system would be utilized for transporting the tires from the storage area to the kiln.

Under Section 106 of the National Historic Preservation Act (NHPA), adverse effects to cultural resources can include changes in visual and noise settings. Should visual and noise characteristics of the plant and its surroundings affect the National Register eligibility of a cultural resource, there would be a possible concern. No change in the visual and noise setting would be expected from the Proposed Action.

The cultural resource data for properties compiled for this analysis resulted from file searches by the Montana Historical Society – State Historic Preservation Office (SHPO) and the National Park Service.

3.10.2 Inventory Results

SHPO records indicate that there are no previously recorded historic or archeological sites within the project site. Further analysis was not attempted. The previously prepared environmental assessment reached similar conclusions that are consistent with current findings regarding the need for any required in-depth cultural analysis. Because the project would occur at a previously disturbed site, the likelihood of finding undiscovered or unrecorded historical properties would be low. The previous searches have determined there are no traditional cultural properties within the proposed site boundary. If cultural materials were encountered during the course of the project, SHPO requested that it be contacted and the site investigated.

The Missouri Headwaters State Park is located one-half to one mile south of the Holcim facility. The previous environmental assessment noted concerns with the increased traffic and air emissions. Impacts from increased traffic and air emissions have been determined to be minor. Air and transportation impacts are discussed in Chapter 4 of this EIS.

The Three Forks of the Missouri National Historic Landmark is located in the vicinity of the project area. According to the NPS, the boundaries have not been established for either the National Historic Landmark or National Register of Historic Places due to lack of landowner agreement and/or landowner objections (Wegman-French, 2004).

The Missouri National Historic Landmark was listed on the National Register of Historic Places in 1966. The National Historic Landmark database includes the following information for the landmark:

- Missouri Headwaters State Park
- National Register Number: 66000433
- Resource Type: Site

The database also includes a Statement of Significance (as of designation – October 9, 1960): Captain William Clark of the Lewis and Clark Expedition, first European-American to discover this spot, concluded that the Missouri River originated where the Three Forks joined. The NPS database also has a recommendation of reducing speed limits, or re-routing traffic to reduce conflicts between tourist and commercial traffic.

3.11 Socioeconomics

The Holcim Trident plant is located in the northwest corner of Gallatin County. The county is the most populated and fastest growing area in southwest Montana. Gallatin County contains the

incorporated cities of Belgrade, Bozeman, Manhattan, and Three Forks. Over 90 percent of the county's population of 67,381 live within a 30-minute drive of Bozeman.

In addition to farming and ranching, other major employment sectors in the county's economy include retail trade, services, manufacturing, and natural resources industries, such as forestry and mining. Tourism is a major component of the economy with Big Sky Resort and Yellowstone National Park attracting millions of visitors annually. Montana State University, with more than 11,000 students and 4,100 employees, is located in Bozeman in the eastern portion of the county. In addition to traditional resource industries, high technology firms specializing in software development, laser technology, and pharmaceutical research have migrated to the county in recent years.

3.11.1 Inventory Methods

This section contains socioeconomic information about Gallatin County. The data source for 1990 and 2000 population, housing, and income characteristics was the U. S. Department of Commerce, Bureau of the Census. The Bureau also furnished 2003 county population estimates. Employment and earnings, or wage information, was provided by the Bureau of Economic Analysis in the U. S. Department of Commerce. The Montana Department of Labor and Industry was the source of additional employment data. Employment and payroll information at Trident was furnished by Holcim.

3.11.2 Inventory Results

Population

Gallatin and Broadwater Counties

Population in the two county areas was 71,766 in 2000 (Table 3.11-1). Gallatin County's population was 67,381 at that time and accounted for 94 percent of the two-county total. Broadwater County's population was 4,385 in 2000.

Population in the two-county area gained nearly 18,000 persons from almost 54,000 persons in 1990 to more than 71,700 by 2000, increasing by 33 percent. Population in both Gallatin and Broadwater county increased by about one-third; Gallatin County's population expanded by almost 17,000 persons, while Broadwater County gained slightly more than 1,000 persons.. The population gain of 33 percent for each county in the 1990 to 2000 decade was greater than the State of Montana's 13 percent increase and the national population gain of 10 percent.

Table 3.11-1 1990-2000 Gallatin and Broadwater County Population Change

County	1990 Population	2000 Population	Numerical Change	Percentage Change
Gallatin County	50,463	67,381	16,918	34%
Broadwater County	3,318	4,385	1,067	32%
Total	53,781	71,766	17,985	33%

Sources: Intermountain Demographics, U. S. Census Bureau

The most recent census bureau estimate for Gallatin County population was 73,243 as of July 1, 2003. Gallatin County's population continued to increase from 2000 to 2003, with a gain of 5,412 residents. Broadwater County's population increased to 4,430 that same year.

The remainder of the socioeconomic analysis will focus on Gallatin County because the Holcim facility is located in that county. Gallatin County also contains the largest population concentration and is the center of economic activity in the region.

Gallatin County Population

In 2000, the unincorporated portion of the county contained the most residents (31,470 people), about 46 percent of the county's total (Table 3.11-2). Bozeman had the next largest concentration of population with 27,509 or 41 percent of the total county. The largest numerical population gain was recorded in unincorporated Gallatin County, which increased by 9,315 residents. Bozeman had the next largest population increase and grew by 4,849 persons from 1990 to 2000.

Table 3.11-2 1990-2000 Gallatin County Population by Area

Area	1990 Population	2000 Population	Numerical Change	Percentage Change
Belgrade	3,411	5,728	2,317	68%
Bozeman	22,660	27,509	4,849	21%
Manhattan	1,034	1,398	362	35%
Three Forks	1,203	1,728	525	44%
Balance of County	22,155	31,470	9,315	42%
Total	**50,463**	**67,831**	**17,368**	**34%**

Sources: Intermountain Demographics, U. S. Census Bureau

Gender and Age

In 1990, Gallatin County's gender ratio was 51 percent males and 49 percent females. By 2000, male population increased to 52 percent of total population, while the female population declined to 48 percent of the total. Median population age was 29.8 in 1990 and increased to 37.5 years of age by 2000.

Gallatin County Population

Forecasts for Gallatin County show that its population will continue to increase throughout its 30 year forecast period (Table 3.11-3). The county's population was forecast to increase to 76,000 residents by 2005 and to 80,000 by 2010. The 2000 to 2010 forecast is for an additional 13,000 people or a 20 percent gain. That rate of population increase is slightly less than the 34 percent population gain occurring from 1990 to 2000. The long range forecasts predict that the county will reach nearly 120,000 persons by 2030.

Table 3.11-3 2000-2030 Gallatin County Forecasts

Year	Population
2000	67,381
2005	76,000
2010	80,000
2015	90,000
2020	98,000
2025	105,000
2030	118,000

Sources: Intermountain Demographics, Gallatin County Planning Department

Housing

Gallatin County's total housing stock increased from 21,350 in 1990 to 28,489 in 2000, an increase of 7,139 housing units (Table 3.11-4). The 33 percent gain in housing units closely paralleled the 34 percent population gain in the same time period. Households, or the number of occupied housing units, increased by 38 percent from 1990 to 2000 and outpaced population and housing unit gains. Household size also declined from 2.65 persons in 1990 to 2.56 persons in 2000. Factors impacting a household formation rate greater than population gains and a decrease in household size include a high divorce rate, a large presence of older persons and young adults, and an expanding economy.

Table 3.11-4 1990-2000 Gallatin County Housing Characteristics

Characteristic	1990	2000	Numerical Change	Percentage Change
Housing Units	21,350	28,489	7,139	33%
Households	19,015	26,323	7,308	38%
Owner	11,125	16,434	5,309	48%
Renter	7,890	9,889	1,999	25%
Vacant	2.335	3,166	831	36%
Seasonal	1,286	1,723	437	34%

Sources: Intermountain Demographics, U.S. Census Bureau

From 1990-2000, the number of owner-occupied housing units increased by 48 percent. Owner-occupied units represented 59 percent of the total occupied units in 1990 and increased to 62 percent of all occupied housing by 2000. The number of renter-occupied units increased by one-fourth in the same time period, and went from 41 percent to 38 percent of all occupied housing units. The number of seasonal homes increased by 437 units, a 34 percent gain in the decade.

The City of Bozeman contained the largest number of housing units of all incorporated cities in the county (Table 3.11-5). It also had the largest number of vacant and seasonal units. Approximately 11 percent of all housing units were vacant in 2000. The owner-occupied vacancy rate was 1.2 percent while the rental vacancy rate was 4.5 percent, both indicators of a

relatively tight housing market. Seasonal housing units, or recreational or second homes, accounted for more than one-half of all vacant homes in 2000.

Table 3.11-5 2000 Gallatin County Housing Characteristics by Area

Housing Characteristic	Belgrade	Bozeman	Manhattan	Three Forks	Gallatin County
Total Units	1,290	9,117	417	549	21,350
Vacant Units	82	366	28	47	2,335
Seasonal Units	8	45	0	1	1,286
Owner Vacancy	2.7%	1.1%	1.8%	2.7%	1.5%
Renter Vacancy	4.7%	2.8%	2.5%	4.2%	4.5%

Sources: Intermountain Demographics, U. S. Census Bureau

Employment

Gallatin County's full and part-time employment reached a total of 50,468 employees by 2000, up from 30,864 in 1990, a gain of almost two-thirds (Table 3.11-6). The services industry contained the most employees in both 2000 and in 1990, and also had the largest increase in employment during the decade. The largest concentrations of employment in that sector were in health, business, and legal services. Retail trade was the second largest industry in the local economy, employing 10,793 persons. That industry also had the second largest employment during the 1990-2000 decade. Large concentrations of employment in the service and retail trade industries were strong indicators of the high impact of tourism on the local economy.

Table 3.11-6 1990-2000 Gallatin County Full and Part-Time Employment by Industry

Sector	1990	2000	Numerical Change	Percentage Change
Agricultural Services	370	891	521	141%
Mining	174	173	-1	<1%
Construction	1,804	4,832	3,028	168%
Manufacturing	2,032	3,154	1,122	55%
Transportation/Utilities	1,029	1,539	510	50%
Wholesale Trade	1,099	1,693	594	54%
Retail Trade	6,342	10,793	4,451	70%
Financial	2,314	3,562	1,248	54%
Services	8,530	15,328	6,798	80%
Government	7,170	8,503	1,333	19%
Total	30,864	50,468	19,604	64%

Sources: Intermountain Demographics, U. S. Bureau of Economic Analysis

In many areas of the west, traditional resource industries such as farming and mining have been declining, particularly in the last decade. That has not been the case in Gallatin County where the county's 1990 farming employment was 1,128 and increased slightly to 1,193 by 2000.

Agricultural services employment nearly tripled during the decade to reach a total of 891 employees by 2000. Mining employment remained almost constant at 173 employees.

In 2002, there were 4,294 employment establishments in Gallatin County. About 4,190 of those establishments were privately owned. Major private employers in the county included Big Sky of Montana, Bozeman Deaconess Hospital, Costco, Louisiana Pacific, and Wal-Mart. Public education also was a major employer with the school districts and Montana State University having a total of 4,100 employees. The current employment at the Holcim facility is 80 employees (Prokop, 2004).

Information from the Montana Department of Labor and Industry in January 2004 indicated that Gallatin County's unemployment rate was relatively low at 3.1 percent, with 1,418 individuals unemployed and looking for work. Montana's unemployment rate was 5.6 percent while the national rate of unemployment was 6.21 percent that same month.

Earnings

Another key indicator in the total economy of an area is earnings (wages paid) by industry (Table 3.11-7). More than $1.2 billion were paid as wages in Gallatin County in 2000. That level of wages paid was more than double the $500 million of wages paid in 1990. The services industry was the largest source of wages paid in 2000. Wages paid in the services industry also increased the greatest from 1990 to 2000 in keeping with national trends. Local, state, and federal governments combined were the next largest source of wages and earnings in the Gallatin County economy in 2000. The total employee compensation that will be paid by Holcim in 2004 is approximately $5.8 million (Prokop, 2004).

Table 3.11-7 1990-2000 Gallatin County Earnings by Industry ($000's)

Sector	1990	2000	Numerical Change	Percentage Change
Agricultural Services	$4,189	$12,713	$8,524	203%
Mining	$3,470	$3,771	$301	9%
Construction	$41,954	$143,040	$101,086	241%
Manufacturing	$42,578	$112,001	$69,423	163%
Transportation/Utilities	$25,660	$45,516	$19,856	77%
Wholesale Trade	$28,628	$58,511	$29,883	104%
Retail Trade	$76,075	$168,318	$92,243	121%
Financial	$19,967	$75,563	$55,596	278%
Services	$127,455	$335,491	$208,036	163%
Government	$134,078	$250,261	$116,183	87%
Total	**$504,054**	**$1,205,185**	**$701,131**	**139%**

Sources: Intermountain Demographics, U. S. Bureau of Economic Analysis

Median Household and Per Capita Income

Median household income in Gallatin County increased from $23,345 in 1990 to $38,120 in 2000, gaining $14,775 during that decade (Table 3.11-8). Median household income increased by 63 percent and outpaced the national rate of inflation. Gallatin County's 2000 median household income at $38,120 also was 15 percent higher than the state's median household income of $33,024.

Table 3.11-8 1990 to

2000 Gallatin County Median Household and Per Capita Income

Income Category	1990	2000	Numerical Change	Percentage Change
Median Household	$23,345	$38,120	$14,775	63%
Per Capita	$12,252	$19,074	$6,822	56%

Sources: Intermountain Demographics, U. S. Census Bureau

Another useful income indicator is per capita income, or the amount of income attributable to each person in an area. Gallatin County's per capita income reached $19,074 in 2000, increasing from $12,252 in 1990. The level of per capita income in the county increased by more than 50 percent during the decade and also was greater than the national inflation rate. Gallatin County's 2000 per capita income was 11 percent higher than the State of Montana's per capita income of $17,151.

Household Income Distribution

Changes in Gallatin County's household income distribution were positive from 1990 to 2000 (Table 3.11-9). There was a net reduction of households in the lower income categories with a corresponding gain of households with higher incomes. The number of households with incomes below $10,000 decreased by 42 percent during the decade. The number of households with incomes between $10,000 and $20,000 declined by 16 percent during the same time. The number of households with incomes greater than $100,000 increased from 415 in 1990 to 2,097 by 2000. The $30,000 to $40,000 income range contained the most households (4,024) in 2000, accounting for 15 percent of Gallatin County's total households.

Table 3.11-9 1990 to 2000 Gallatin County Household Income Distribution

Income Range $ 1,000's	1990 Households	2000 Households	Numerical Change	Percentage Change
Under 10	3,657	2,139	-1,518	-42%
10 to 20	4,496	3,799	-697	-16%
20 to 30	3,736	3,907	171	5%
30 to 40	2,796	4,024	1,228	44%
40 to 50	1,693	3,215	1,522	90%
50 to 60	954	2,616	1,662	174%
60 to 75	771	2,403	1,632	212%
75 to 100	589	2,157	1,568	266%
100 to 125	174	1,105	841	483%
125 to 150	47	390	343	730%
Over 150	194	692	498	257%
Total	**19,107**	**26,357**	**7,250**	**38%**

Sources: Intermountain Demographics, U. S. Census Bureau

CHAPTER 4
Environmental Impacts

4.1 Introduction

This chapter describes the environmental impacts of the Proposed Action and the No Action alternatives. The following sections document the impacts and reasonable mitigation measures that would reduce or eliminate impacts:

- Air Quality
- Risks to Human Health
- Risks to the Environment
- Land Use
- Transportation and Public Services
- Socioeconomics
- Property Impacts

The Proposed Action would burn whole tires to supplement up to 15 percent of the required fuel for the kiln. In order for the tires to be inserted into the kiln, a mid-kiln injection system (i.e., gate) would be installed into the kiln shell (refer to Chapter 2 for detailed description of the Proposed Action). The Proposed Action would also require additional miscellaneous equipment to handle and store tires.

Consideration of the No Action Alternative is required. Under the No Action Alternative, DEQ would deny the modification to the air quality permit and not license the site as a tire resource recovery facility. Currently permitted operations and emission levels would continue. No other reasonable alternatives have been identified (refer to Chapter 2 for identification and evaluation of alternatives).

Irreversible and irretrievable commitments of resources are discussed in Section 4.9. Cumulative impacts are described in Section 4.10. Potential mitigation measures are listed in Section 4.11.

4.2 Air Quality

Ambient impact modeling results presented in Section 4.2.3.6 demonstrate compliance with the ambient air quality standards.

4.2.1 Methods

Kiln criteria pollutant emissions were obtained as baseline information from source tests and existing permit limits. HAPs emission estimates were developed from the results of source tests at other cement kilns using tires as fuel (refer to Appendix B for emissions estimation techniques). For this EIS, current maximum potential emissions, based on permitted production of 425,000 tons of clinker per year, are called 'baseline' emissions. Maximum potential

emissions for 425,000 tons of clinker while burning tires are called 'cumulative' emissions. The baseline and cumulative emissions estimates both include slag.

Air quality impacts from the facility were assessed using EPA's AERMOD modeling system. AERMOD uses emission rate data, emission point parameters (e.g., stack temperature, stack exhaust flow rate, etc.) and local meteorological data to predict site-specific impacts for each pollutant. Modeling protocol and modeling results can be found in Appendix B. Ambient air quality standards are listed in Chapter 3, Table 3.2-3.

HAP emissions have been estimated and have been modeled to determine ambient concentrations. There are no ambient air quality standards for HAPs in the DEQ and EPA regulations. HAP emission estimates and modeled impacts were used in the health and environmental risk analyses and are reported in Section 4.2.3.2.

4.2.2 Impacts of the No-Action Alternative

Under the No Action Alternative, DEQ would deny issuance of the modification to Holcim's air quality permit, and Holcim would not be allowed to add tires to its fuel mix. Emissions from the facility and ambient air quality impacts would continue at the currently permitted levels (Table 4.2-1).

4.2.3 Impacts of the Proposed Action

Holcim is currently authorized to burn natural gas, coal, and petroleum coke to fuel the cement kiln. The proposed project would include mid-kiln combustion of whole waste tires for up to 15 percent of the total fuel heat input. The air quality permit application, submitted in October 2001, contained estimates of criteria pollutant, HAPs, and CKD emissions associated with the proposed project.

Criteria Pollutants

This section summarizes the estimated criteria pollutant emissions changes resulting from use of tires as fuel. The potential baseline and cumulative emissions of criteria pollutants and CO_2 from the kiln are listed in Table 4.2-1. Criteria pollutant emissions have been modeled and the predicted impacts compared to the applicable MAAQS and NAAQS. CO_2 is a greenhouse gas for which there are no standards and has been included for informational purposes.

Table 4.2-1 Potential Annual Kiln Criteria Pollutant and CO_2 Emissions

Pollutant	Baseline Emission Rate (tons/year)	Cumulative Emission Rate (tons/year)
SO_2	543	543
NO_x	6,868	6,868
CO	121	310
PM_{10}	164	164
VOC	10	10
Lead	0.15	0.15
CO_2	446,250	446,250

Sources: Criteria Pollutant Emissions, DEQ Air Quality Permit 0982-10; Holcim 2004. CO_2 emissions estimate, AP-42 Section 11.6.

The addition of tires to the fuel mix is expected to cause an increase of CO emissions from the kiln. Other criteria pollutant emissions would decrease or be unchanged while burning tires. CO is emitted as a result of incomplete combustion of carbon in fuel. Holcim estimates that addition of tires to the fuel mix would increase potential kiln CO emissions from 121 to 310 tons per year. The estimated CO increase triggers PSD permitting requirements (Section 4.2.3.4).
Fuel combustion in the kiln causes the formation of NO_x emissions due to oxidation of nitrogen in the combustion air and in the fuel. VOCs can be emitted as a result of unburned fuel or can be formed in the combustion process. VOC and NO_x emissions are not expected to increase as a result of tire burning.

SO_2 emissions from cement kilns are generated through oxidation of sulfur compounds in the raw materials and from sulfur in the fuel. The alkaline nature of the cement provides for direct absorption of SO_2 into the product, thereby reducing SO_2 emissions in the exhaust stream. No increase in sulfur dioxide emissions is projected from burning tires.
Particulate matter emissions from the Holcim kiln are controlled by an electrostatic precipitator (ESP) and are not expected to change with tire burning. Permit 0982-10 limits kiln particulate matter emissions to 0.77 lb/ton of clinker produced. This limit will not change. The source test data from other cement kilns showed that the PM_{10} emissions were reduced or unchanged by the use of tires for fuel (Holcim, 2004).

Hazardous Air Pollutants

Holcim estimated cumulative HAP emissions for use in the health risk assessment. During preparation of the EIS, DEQ reviewed and adjusted the emission estimates as described in Appendix B. The cumulative inventory includes estimated emissions from coal, coke, tire fuels, recycled glass used as a source of silicate in the kiln feed, and smelter slag used as an iron source. Cumulative and baseline kiln HAP emissions estimates are listed in Table 4.2-2. Carcinogenic total HAPs and 21 other HAP pollutants, which are major HAP contributors, decreased in cumulative emissions. Twenty-three other HAPs increased. Nine HAPs remained the same.

Table 4.2-2 Potential Annual Kiln HAP Emissions

Compound	Baseline Emissions lb/yr	Cumulative Emissions lb/yr	Difference lb/hr
Acetaldehyde	4,178	595	-3,583
Acrolein	98.3	98.3	-
Trichloroethene	3.26	27.6	+24.34
Antimony	3.52	3.57	-0.05
Arsenic	6.04	4.36	-1.68
Benzene	9,237	7,552	-1,685
Beryllium	1.49	1.12	-0.37
Bis (2-ethylhexyl)phthalate	429	532	+103
Bromomethane	43.2	28.7	-14.5
1,3 Butadiene/Butadiene	31.0	79.8	+48.8
2-Butanone (MEK)	8.94	8.31	-0.63
Butylbenzylphthalate	0.53	0.53	-
Cadmium	9.10	3.52	-5.58
Carbon Disulfide	1,141	161	-980
Carbon Tetrachloride	3.35	3.35	-
Chlorine	5,272	6,355	+1,083
Chlorobenzene	67.9	68.8	+0.9
Chloromethane	436	181	-255
Chromium (total)	13.90	10.6	-3.3
Chromium 6	2.42	1.29	-1.13
Cobalt	9.18	5.69	-3.49
Di-n-Butyphthalate	13.4	13.4	-
1,4 Dichlorobenzene	13.4	88.3	+74.9
Dichloromethane	394	2,716	+2,322
Dimethyl Phthalate	18.6	18.6	-
2,4-Dinitrophenol	101	101	-
Ethylbenzene	1,945	2,991	+1,046
Chloroethane	28.6	28.6	-
Formaldehyde	10,846	13,643	+2,797
Hydrogen chloride	6,380	6,714	+334
Hydrogen fluoride	197	304	+107
Lead	128	130	+2
Manganese	156	433	+277
Mercury	102	137	+35
4-Methyl phenol	56.6	44.2	-12.4
Methylene chloride	366	1,769	+1,403
Naphthalene	572	461	-111
Nickel	15.8	20.0	+4.2
Nitrobenzene	13.5	14.5	+1.0
4-Nitrophenol	287	287	-
Phenol	930	592	-338
Phosphorus	32.2	40.8	+8.6
Selenium	75.8	47.1	-28.7
Styrene	2,373	4,720	+2,347
1,1,1 Trichloroethane	1.61	12.8	+11.19
Toluene	11,546	17,485	+5,939
Vinyl chloride	93.7	167	+73.3
Xylenes, total	8,567	13,941	+5,374
Zinc[(1)]	4,943	2,058	-2,885

Compound	Baseline Emissions lb/yr	Cumulative Emissions lb/yr	Difference lb/hr
TCDD Eq. (2)	7.66 x 10^{-9}	7.66 x $1\text{-}0^{-9}$	-
Total PCBs	3.88	3.66	-0.22
PAH- Total	756	561	-195
PAH-Non-carcinogenic totals	183	99	-84
PAH-Carcinogenic totals	573	462	-111

(1) Zinc is not a HAP but is a common constituent in tires.
(2) The TCDD eq. value is the PC MACT limit.
Source: Air Quality Technical Analysis Report, Appendix B.

Cement Kiln Dust

Air pollutants emitted from the kiln as particulate are collected by the ESP as cement kiln dust (CKD). CKD consists primarily of particulate matter but also contains trace amounts of particulate-phase HAPs. Handling of the CKD after collection can cause particulate emissions.

The amount of HAPs released in the CKD emissions is based on the ratio of CKD to clinker produced, concentration of each HAP in the stack exhaust, and the collection efficiency of the ESP. The concentration of particulate phase HAPs in the CKD would change with the addition of tires to the fuel stream. Small amounts of CKD are released during loading and unloading of the CKD silo and during transportation and disposal of the CKD.

Table 4.2-3 lists the estimated baseline and cumulative HAPs emissions associated with CKD handling. CKD emissions are included in the air dispersion modeling used to determine the peak ambient impact of each HAP emitted from the kiln and CKD sources. For cumulative emissions, most HAP emissions would decrease. Some HAPs increase, such as manganese, which is not classified as a human carcinogen. CKD emissions are mitigated through fugitive dust controls during CKD handling.

Table 4.2-3 Baseline and Cumulative Annual CKD HAP Emissions

Compound	Baseline (lb/yr)	Cumulative (lb/yr)	Compound	Baseline (lb/yr)	Cumulative (lb/yr)
Antimony	0.19	0.20	Nickel	0.88	1.10
Arsenic	0.33	0.24	Phosphorus	1.78	2.22
Beryllium	0.08	0.06	Selenium	4.18	2.60
Cadmium	0.50	0.19	Zinc(1)	272	114
Chromium (total)	0.77	0.59	Mercury(3)	0.13	0.04
Chromium 6	0.13	0.07	Hydrogen chloride(3)	2.22	2.34
Cobalt	0.50	0.31	Hydrogen fluoride(3)	0.07	0.11
Lead	7.05	7.17	TCDD Eq. (2)	0.00000022	0.00000022
Manganese	8.63	23.93			

(1) Zinc is not a HAP but is a common constituent in tires.
(2) The TCDD eq. contribution to CKD is based on maximum TCDD emissions allowed under the PC-MACT rules and the assumption that 20% of the emission is particulate. Holcim has assumed that it is 20% particulate.
(3) The mercury, hydrogen chloride and hydrogen fluoride contributions to CKD are based on the assumption that 5% of the emission is particulate.
Source: Holcim, 2004

Prevention of Significant Deterioration

CO emissions are estimated to increase beyond the PSD significance level as a result of tire burning. The estimated increase of 189 tons per year exceeds the PSD significant increase level of 100 tons per year. Therefore, tire burning is subject to the PSD requirement for Best Available Control Technology (BACT) review and other PSD provisions for CO.

BACT is an emission limitation based on the maximum reduction of each regulated pollutant. It is a case-by-case determination based on a balance between technical and economic feasibility and potential environmental and energy impacts of the control options. EPA recommends that a BACT analysis use a top-down approach. First, the control options for the pollutant of concern are identified. Second, the control options are reviewed for technical feasibility. Third, the remaining control options are ranked according to control efficiency. Fourth, the control options are reviewed based on environmental, economic, and energy impacts. Finally, BACT is selected and a limit is set, if appropriate. BACT may be accomplished through many different processes, including good combustion practices.

Holcim submitted a CO BACT analysis to meet the PSD requirements. DEQ reviewed the BACT analysis in the Preliminary Determination for Permit #0982 (Appendix C) and determined that proper design and combustion constitutes BACT for CO and HAPs. Table 4.2-4 contains a summary of Holcim's BACT analysis. A detailed discussion of each of the BACT technologies is provided in the air quality permit application.

Table 4.2-4 BACT Analysis Summary

Pollutant	BACT Considered	Comments
CO	Wet Scrubber, Regenerative Thermal Oxidation, and Regenerative Catalytic Oxidation	Energy needed to reheat gas stream produces additional pollutants, wet scrubbing consumes water. Cost is beyond industry norm for CO control.
	Proper Design and Combustion	Minimizes formation of CO in the kiln environment. Proper design and combustion are considered BACT for CO.
Gaseous HAPs	Wet Scrubber, Regenerative Thermal Oxidation, and Regenerative Catalytic Oxidation	Not effective due to low contaminant concentrations. Energy needed to reheat gas stream produces additional pollutants, wet scrubbing consumes water.
	Carbon Adsorption	Requires electricity consumption and disposal of adsorption media.
	Proper Design and Combustion	Minimizes formation of HAPs in the kiln environment. Proper design and combustion are considered BACT for gaseous HAPs emissions.
Particulate HAPs	Electrostatic Precipitator (ESP)	The existing ESP is considered BACT for control of HAPs emitted as particulate.

Source: Holcim, 2004

Regenerative thermal and catalytic oxidizers (RTO) and (RCO)

Post-combustion controls for CO, such as RTO and RCO, were rejected based on cost and technical infeasibility. The costs from the BACT analysis were approximately $5.3 million in capital expenses (Holcim, 2004). RCO was analyzed, but was considered technically infeasible

due to the poisoning effect the cement kiln would have on the catalyst. Sulfur compounds and particulate matter can foul both the ESP and baghouse systems, so the placement of the units would have to be after the ESP and baghouse systems. Reheating the exhaust stream to 600ºF and 1,500ºF for the RCO and RTO, respectively, would have to occur. The capital cost of RTO was estimated at $3.6 million, or $6,096 per ton of CO removed. Adding a scrubber to an RTO to control SO_x and fine particulates would increase the cost per ton to $13,506 (Holcim, 2004), but cost per ton output would increase with control equipment costs and operation and maintenance costs (i.e., reheating of the exhaust gas). A wet scrubber would create the additional problem of disposing of solid waste and wastewater. Conversations with the Texas Commission on Environmental Quality (TCEQ, 2004) indicate that a similar RTO process in Texas is being phased out due to fuel costs and upsets.

Thermal and catalytic oxidation are not cost effective and do not constitute BACT. The cost of installation and operation would exceed the expected $250,000 per year fuel cost savings from burning tires.

Gas adsorption

Gas adsorption is not a pollutant destruction method. The pollutant is adsorbed on the surface (mostly the internal surface) of a granule, bead, or crystal of adsorbent material. It is not absorbed by a chemical reaction. The adsorbed material is held physically, rather loosely, and can be released (desorbed) rather easily by either heat or vacuum.

Adsorbents that might be used include activated carbon, alumina, silica gel, and bauxite. Holcim proposed an activated carbon system. The total capital investment for this carbon adsorption system was estimated at approximately $987,000 (Holcim, 2004). The BACT analysis indicates the annual cost would be approximately $410,870. The carbon adsorption system would require more energy, and spent carbon would have to be disposed of.

Adsorption is not cost effective because of the capital and operating costs, and it does not constitute BACT.

Wet electrostatic precipitator (ESP)

According to the BACT analysis, there is a potential in any of the alternative pollution control options to cause additional toxic and environmental impacts (Holcim, 2004). A wet ESP can control the finer particulates associated with HAPs, but this would require either a modification to the existing dry ESP or an additional system. Wet ESPs can collect sticky particles and mists usually associated with HAPs. The humid atmosphere that results from washing the electrodes can absorb gases or cause pollutants to condense, cool, and condition the gas stream. The existing ESP can be converted to a polishing stage of wet ESP cells that would provide a quenching effect for the discharge gases and possibly be used to control dioxins and furans. As modifications would need to be included in the current duct work, a stand alone wet ESP system would be even more costly. The additional equipment would need more space and would have a larger energy requirement (CATC, 2003).

Wet ESPs produce a sludge that would require treatment. Wash water must be injected or sprayed near the top of the collector pipes. This water flows with the collected particles into a sump from which the fluid can be pumped or drained for treatment or recycling in the wet kiln

slurry process. The remainder of the water must be routed to a settling pond or dewatered with subsequent disposal of the sludge (AWMA, 1992). This wash system replaces rapping mechanisms usually used on dry ESP's.

Wet ESPs are considered infeasible because of reliability issues and cost and do not constitute BACT.

Proper Design and Combustion

Reduction of CO would be accomplished by controlling the combustion temperature, residence time, and available oxygen. Normal combustion practice at Holcim involves maximizing the heating efficiency of the fuel in an effort to minimize fuel usage. The efficiency of fuel combustion also minimizes CO formation. Therefore, proper design and combustion constitute BACT for CO.

Reduction of HAPs in the kiln would be accomplished by controlling the combustion temperature, residence time, and available oxygen. Normal combustion practice at Holcim involves maximizing the heating efficiency of the fuel in an effort to minimize fuel usage. The efficiency of fuel combustion also minimizes HAP formation. Furthermore, existing particulate control devices provide control of the HAPs (arsenic, cadmium, beryllium, chromium, manganese, lead, mercury, etc.) that are emitted as particulate. Therefore, proper design and combustion constitute BACT for HAPs.

Maximum Achievable Control Technology

As part of the CAAA, Congress adopted a program for control of air toxics (i.e., HAPs). Congress designated 188 individual HAPs for control through development of National Emissions Standards for Hazardous Air Pollutants (NESHAPs). These NESHAP standards have taken the form of Maximum Achievable Control Technology (MACT) requirements for emission source categories.

EPA issued the final NESHAPs for portland cement manufacturing in June 1999, with amendments in March 2002. The NESHAPs required the application of Portland Cement Maximum Achievable Control Technology (PC MACT) for cement plants that are major sources of HAPs (EPA, March 2002). The NESHAPs for Portland Cement Plants are included in the Code of Federal Regulations (CFR) Title 40, Part 63, Subpart LLL.

PC-MACT emissions standards are incorporated into Holcim's air quality permit. The facility's status as an area source under the PC-MACT regulations would not change as a result of tire burning, as explained in Holcim's air quality permit application (Holcim, 2004). Holcim's air quality permit requires periodic TCDD (2,3,7,8-tetrachlorodibenzodioxin, a dioxin) testing to demonstrate compliance with the PC-MACT standards (DEQ Air Quality Permit 0982-10).

Ambient Impact Modeling

Holcim submitted air dispersion modeling to predict the impacts of tire burning on ambient concentrations of criteria pollutants and HAPs. Holcim's final modeling of the Trident plant was performed using the most current version of EPA's AERMOD modeling system (version 03273).

The modeling results were reviewed by DEQ, emissions associated with Holcim's slag use were added, and the model was approved by DEQ.

Holcim's air quality permit application included a demonstration of compliance with the applicable MAAQS and NAAQS for the criteria pollutants. Peak modeled impacts occur at or near the Holcim property boundary, and modeled impacts drop off with distance from the source. Background concentration values were provided by DEQ. Additional information regarding the modeling can be found in Appendix B.

The modeled results indicate that the total concentration of each criteria pollutant would be below both state and federal air standards. Complete results of the compliance modeling are listed in Table 4.2-5.

Table 4.2-5 Demonstration of Compliance with NAAQS and MAAQS

Poll.	Avg. Period	Holcim Impact ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)	TOTAL Concentration ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	MAAQS ($\mu g/m^3$)
NO_2	Annual	43.5[b]	6	**49.5**	100	94
	1-hour	329[b]	75	**404**	---	564[a]
SO_2	Annual	5	3	**8**	80	52
	24-hour	26	11	**37**	365[a]	262[a]
	3-hour	74	26	**100**	1,300[a]	---
	1-hour	130	35	**165**	---	1,300[c]
CO	8-hour	27	1,150	**1,177**	10,000[a]	10,350[a]
	1-hour	113	1,725	**1,838**	40,000[a]	26,450[a]
PM_{10}	Annual	1	8	**9**	50	50
	24-hour	8	30	**38**	150[a]	150[a]
O_3 (as VOC)	1-hour	2	N/A	**2**	235	196[a]
Lead	Quarter	0.033[d]	N/A	**0.033[d]**	1.5	---
	90-day	0.033[d]	N/A	**0.033[d]**	---	1.5

[a] Not to be exceeded more than once per year.
[b] These values obtained with the ozone limiting method procedure.
[c] Not to be exceeded more than 18 times in 12 months.
[d] Tenth high modeled 1-hour value used for conservative comparison with standard.

4.3 Human Health Risk

This section discusses the potential risk to human health from modifying the air quality permit to allow tire burning and the use of ASARCO smelter slag as an iron source. DEQ prepared the "*Human Health and Ecological Risk Assessment of Kiln-Related Emissions at the Holcim Trident Cement Plant*", herein referred to as the "Risk Assessment" (Portage, 2005) (refer to Appendix A). Two previous risk assessments (Bison and Kleinfelder, 2001 and 2004b) were completed for the Holcim facility and the Proposed Action to burn whole tires, and each of these assessments concluded that the risk to human health and the environment would be negligible. However, due to the public interest in this proposal, DEQ decided to obtain an independent evaluation for this EIS. This independent evaluation was performed by Portage Environmental on behalf of DEQ (refer to Appendix A).

The risk assessment evaluated risks to human health and the environment associated with currently permitted operations (the baseline condition) and with proposed operation alterations

(the cumulative condition) at the facility. Both conditions included emissions from smelter slag used as an iron source.

Air Permit Application

Holcim's 2001 application included a human health risk assessment and a Screening Level Ecological Risk Assessment (SLERA) addressing the maximum anticipated change in risk associated with the proposed action (Bison and Kleinfelder, 2001 and 2004a). These risk assessments used emissions data from 13 other cement kilns that have measured stack emissions rates before and after use of tires. The difference in emissions rates before and after use of tires was calculated for each HAP at each facility. Predicted constituent of potential concern (COPC) emission rates resulting from the addition of glass into the kiln were included in the assessment. Holcim's application did not include slag because Holcim did not believe slag was subject to the provisions of 75-2-215, MCA, or the risk assessment requirements in ARM 17.8.770.

Dispersion modeling software (AERMOD) used the predicted difference in emissions rates from use of tires to predict ground-level ambient air concentrations at various locations of potential concern around the facility. A model provided by the State of California's Air Toxics Hot Spots Program (California EPA, 2003) was then used to estimate human health exposure and risk.

4.3.1 Methods

The risk assessment evaluated the stack emissions and fugitive emissions resulting from CKD management. Once emitted, the dispersion of COPCs is dictated by wind speed and direction. The predominant local wind direction is from the southwest to the northeast, following the Missouri River where the river flows into a canyon. On average and over the long term, ambient air concentrations of emitted COPCs are expected to be greater downwind of the facility.

The methodology used to estimate emission rates and conduct the dispersion modeling is described in Appendix B. Emission rates for all HAPs, except dioxin, were based on data provided by Holcim regarding measured emissions before and after use of whole tires at 13 other cement plants nationally (Bison and Kleinfelder, 2004a). Dioxin emissions were based on the PC-MACT emission limits for dioxin. To check the validity of the emission rate estimates, 2002 and 2003 stack test data from the Trident plant were used for dioxins/furans, polycyclic aromatic hydrocarbons (PAHs), hydrogen chloride, and 12 metals. The stack test results were compared to the estimated emission rates for the baseline and cumulative condition and to emissions estimated using AP-42 factors (completion of Air Pollutant Emissions Factors from EPA tabulated by source). Dioxin/furan results were compared to the PC-MACT limit. This comparison indicated that the emissions estimated for the cumulative condition exceeded test data results and that dioxin/furan emissions were less than the PC-MACT limit (Lorenzen, 2004). According to these findings, the emission rate estimates used in the risk assessment should provide a conservatively high estimate of the future potential emission rates at the facility.

Multipliers to the emission rates used in the risk assessment were applied to account for ESP upset conditions. The multipliers were developed from information submitted by Holcim (Bison and Kleinfelder, 2004a). The actual values for the multipliers and the methodology can be found in Appendix B.

Ground–level air concentrations at various receptor points surrounding the facility were estimated from stack and cement kiln dust emission rates using AERMOD. AERMOD incorporates several climatic variables, such as wind speed and direction. Ground-level air concentrations for COPCs in the cement kiln dust (CKD) were calculated using individual model runs with three CKD emission points plus the kiln. Ground-level air concentrations for COPCs not in the CKD were modeled using only the kiln stack emission point. Dispersion coefficients, expressed in units of micrograms/cubic meter per grams/second [(ug/m^3)/(g/sec)], were generated by the AERMOD model runs for each receptor point. Calculations were then performed to determine the ground-level air concentration for the worst-case 1-hour peak location, worst-case annual average location, locations in or near Three Forks, Manhattan, and Belgrade, and at receptor points located on the Jefferson, Madison, Gallatin and Missouri rivers. The annual average worst-case location was located along the Holcim property boundary, northeast of the stack.

Calculated ground-level air concentrations were used as inputs into risk assessment models that predict the transport of COPCs in the environment and the resulting exposure to people, plants and animals. The Air Toxics Hot Spots model developed by California EPA (2003) was used due to its relative simplicity and health protectiveness (Portage, 2004b). The California EPA model is used to predict constituent concentrations in soil, surface water, and a variety of domestic and wild food products. The model also estimates potential exposure of receptors to the constituents in each of these media. The risk assessment used default assumptions specified in the California EPA risk assessment model, with some exceptions. The concentrations of constituents in soil were based on a 100-year period of operation in accordance with EPA (1999) guidance, rather than the default value of 70 years recommended by the California EPA model. Information from EPA was used in cases where data are not provided by the California EPA model. For example, several parameters necessary to model the transport of mercury in the environment were obtained from EPA guidance.

The resulting exposures to relevant receptors (Holcim workers, existing residents, future potential residents, and recreational site users), in terms of an average daily dose, were compared to toxicity factors (cancer slope factors for potential carcinogens), reference doses (i.e., calculating probabilities of risk of developing cancer for noncarcinogens) relevant to chronic long-term exposure, and acute reference doses for noncarcinogens relevant to acute short-term exposure developed by EPA to determine risks. The potential for acute risk from exposure during upset conditions was also evaluated. Consistent with regulatory guidance, potential lead exposure was evaluated using the EPA Integrated Exposure and Uptake Biokinetic model (IEUBK; EPA, 2004).

4.3.2 Impacts of the No Action Alternative

The risk assessment evaluated multiple types of exposure scenarios to reflect the range of exposures that may be experienced by the broader community within the Three Forks to Bozeman region. Exposure to COPCs, and accordingly the non-cancer hazards and the cancer risks, become smaller with increased distance from the worst-case exposure locations. Risk assessment results for the baseline condition at the worst case locations for both acute and chronic exposure are as follows:

	Average Exposure	High-end Exposure
Acute (short-term) non-cancer hazard index	not applicable	0.4
Chronic (long-term) non-cancer hazard index	0.1	0.2
Chronic cancer risk	2×10^{-6}	1×10^{-5}

Consistent with EPA guidance, all risk assessment results are expressed to one significant figure. This approach recognized the degree of accuracy inherent to any quantitative risk assessment.

Hazard indexes below 1.0 indicate that no health hazards are expected as a result of exposure. This conclusion recognizes a toxicological principle that there are threshold levels of exposure below which exposure to constituents does not cause a toxic effect. The worst-case location for chronic exposure is at the Holcim property boundary on the predominant downwind side of the facility. The worst-case location for the acute exposure is across the Missouri River and up the hillside to an elevation similar to the Holcim stack height. No non-cancer health risks are predicted by the risk assessment for the No Action Alternative.

A cancer risk of 1×10^{-5} implies that on average one person out of 100,000 people exposed for a lifetime to the predicted constituent concentrations at the worst-case location may get cancer. This probability statement does not predict the type of cancer or whether the cancer would be treatable or not. Moreover, it is the incrementally increased risk of getting cancer that is over and above the background rate from all causes of cancer (natural and anthropogenic) of 1 out of 3.

Currently, federal and state laws and regulations do not provide a definition of an acceptable risk level for exposure to hazardous air pollutants. ARM 17.8.740 defines a negligible risk for carcinogens as an increase in the excess lifetime cancer risk of less than 1×10^{-6} for any individual carcinogen and 1×10^{-5} for the aggregate of all pollutants. This standard is intended to apply to the change in risk associated with the change in emissions resulting from the incineration activities. It does not apply to the total risk from all facility emissions, which are evaluated in this EIS for informational purposes. Regarding constituent spills onto soil and water, federal guidelines contained in the National Contingency Plan (EPA 1990) of "acceptable" upper bound cancer risks to protect human health, including sensitive individuals, range from 1×10^{-4} to 1×10^{-6} (a 1 in 10,000 to 1 in 1,000,000 probability of developing cancer due to lifetime exposure to a carcinogen). Additional information on acceptable risk levels is provided in the risk assessment (Appendix A).

4.3.3 Impacts of the Proposed Action

The risk assessment findings for the Proposed Action are presented in greater detail than for the No Action Alternative. The cumulative condition is used in the risk assessment to evaluate health hazards and risks from exposure to COPCs associated with the Proposed Action. Section 4.3.3.1 presents the risk assessment results for each of the exposure locations evaluated in the risk assessment. A variety of different exposure locations are evaluated to address the range of exposure conditions that may be experienced by the broader community within the Three Forks to Bozeman region. Section 4.3.3.2 presents a more concise summary of the risk assessment findings, and it concludes with an overall interpretation of the risk assessment results.

Potential Health Hazards

Acute and Chronic Non-carcinogenic Hazards

The potential for adverse health effects from acute exposures and from chronic exposures to non-carcinogens is estimated by comparing estimated intake values (I) with reference doses (RfDs). The RfDs are threshold levels, specified by EPA, below which no adverse effects are expected to occur. This relationship is mathematically described as

$$\text{Hazard Quotient} = I/RfD$$

If intake exceeds the reference dose, the hazard quotient (HQ) will exceed 1.0, indicating a potential for adverse health effects. For simultaneous exposure to multiple constituents with similar toxic effects, a hazard index (HI) is calculated as the sum of constituent-specific HQs. Generally, HQs and HIs are reported to only one significant figure, consistent with the inherent level of accuracy of a risk assessment.

The quantitative assessment of acute hazards showed that all HQs and the total HI were below 1.0, indicating no known risk from acute exposure to ground-level air concentrations at the worst-case location for the 1-hour peak concentration. These results were applicable to both the general population and facility workers. Acute hazard estimates for the baseline and cumulative conditions were indistinguishable.

Chronic Non-Carcinogenic Hazards

The evaluations of chronic exposure to non-carcinogenic COPCs were based on the 1-year annual average worst-case ground-level air concentrations. The estimated chronic non-carcinogenic HIs were:

	Average Exposure	High-End Exposure
Baseline Condition:	0.07	0.2
Cumulative Condition:	0.1	0.3

All HQs and the total HI were below 1.0, indicating no expected hazard from chronic exposure. The assessment considered a multi-pathway exposure to a future potential resident located at the facility boundary.

Blood-Lead Levels

The EPA evaluates the risk from lead exposure based on blood lead concentrations. Young children are believed to be most sensitive to the toxic effects of lead exposure. The blood lead level in children aged 0 to 6 years due to exposures to lead was estimated using EPA's IEUBK model (EPA, 2004). Blood-lead levels are expressed as micrograms of lead per deciliter of blood (:g/dL). The model input included lead concentrations in media (water, soil, air, etc) and food at the worst-case location that were predicted using the same risk assessment model developed for evaluation of other COPCs. The predicted blood-lead levels in children for both the baseline and cumulative conditions were a geometric mean of 1.2 µg/dL with 0 percent exceeding 10 µg/dL.

The change in lead emissions for the cumulative condition did not result in different blood-lead concentrations at the number of significant figures reported above. Predicted blood-lead concentrations are below the 10 µg/dL blood-lead standard established by the U.S. Center for Disease Control (CDC, 1991), a level below which no special actions are recommended. The EPA (1994) recommends that residential soil concentrations not exceed a level such that a typical child would have greater than a 5 percent chance of exceeding 10 µg/dL in the blood.

Carcinogenic Risks

Exposure to carcinogens and the associated risk were evaluated using a different methodology than that for noncarcinogens. Risks to residents were evaluated for the following conditions:

- Risks at the Worst-Case Location – evaluated risk for the most exposed receptor, an individual living a subsistence type of lifestyle at the location of the worst-case ground-level air concentration.
- Population Distribution of Risks – evaluated the distribution of risk among individuals within a community based on ground-level air concentrations at the worst-case location.
- Risks in Nearby Communities – evaluated risks to individuals living in established communities (Three Forks, Manhattan, and Belgrade) around the facility.
- Risks from Locally Caught Fish and Game – evaluated risk to individuals who hunt and fish in the area surrounding the facility.

The evaluations of chronic exposure to carcinogenic COPCs were based on the 1-year annual average ground-level air concentrations at different locations as appropriate for each type of exposure.

Cancer Risks at the Worst-Case Location

The worst-case location was determined by the AERMOD model to be at the facility's property boundary in the downwind direction. A future potential resident was assumed to work and live at this location and raise a large percentage of his or her food at this location. Water was assumed to come from the worst-case receptor location on the Missouri River. Total cancer risks and the cancer risks from dioxin alone are:

Worst-Case Location Risks

	Average Exposure	High-End Exposure
Baseline Condition		
Dioxin:	1×10^{-6}	8×10^{-6}
Total*:	2×10^{-6}	1×10^{-5}
Cumulative Condition		
Dioxin:	1×10^{-6}	8×10^{-6}
Total*:	2×10^{-6}	1×10^{-5}

*Total – the sum of risks for all COPCs.

Total risks were derived by predicted exposure to dioxin. For the baseline condition, dioxin risk was greatest for the mother's milk pathway (3.0×10^{-7}) followed by the beef ingestion pathway (2.6×10^{-7}) and other food ingestion pathways.

Population Distribution of Risks

A stochastic analysis was performed to calculate the distribution of risks for individuals within a population. Crystal Ball was the software used to conduct the stochastic analysis for both the baseline and cumulative condition. If everyone in the community were to experience exposure based on the pollutant concentrations at the worst-case location, the stochastic model as applied for the cumulative condition in this assessment indicated the following aggregate distribution of risk within the population:

Percentile	Risk Level
50%	5×10^{-6}
90%	6×10^{-6}
95%	7×10^{-6}
100%	1×10^{-5}

The above results indicate a strongly lognormal distribution of risk. The risk level at the 90th percentile, which is 6×10^{-6}, is about one-half the risk level at the 100th percentile, which is 1×10^{-5}. To put this in perspective, 5×10^{-6} is exactly one-half of 1×10^{-5}. These results indicate that a large majority of people experience risks estimated by the average-exposure scenario.

Risks in Nearby Communities

This section of the risk assessment quantifies the risks at different receptor points located near established communities. The risks were evaluated in nearby communities by examining non-food related exposure pathways, based on ground-level air concentrations at receptor points near each community. Default model assumptions for non-food related pathways were unchanged. Using this approach, the cumulative condition risks were estimated as:

Cumulative Condition Risks for Non-Ingestion* Pathways in Various Communities

	Average Exposure	High-End Exposure
Worst-Case Location	7×10^{-7}	3×10^{-6}
Three Forks School	2×10^{-8}	5×10^{-8}
Manhattan	4×10^{-9}	1×10^{-8}
Belgrade Airport	2×10^{-9}	9×10^{-9}

*Includes inhalation, dermal absorption and soil ingestion pathways based on predicted soil concentrations for each community.

Risks are substantially different across communities when considering only non-food pathways. This scenario is applicable to community residents without gardens who obtain food through supermarkets. Under these assumptions, risks were 100 to 1,000 times lower in the communities than for the future potential worst-case receptor. Among the communities evaluated, risks were highest for residents in or near Three Forks.

The Three Forks receptor location was used to evaluate exposure via all pathways, including the food pathways. Cattle grazing or grain production were chosen as the most likely exposure pathways under existing and future scenarios in the general area surrounding the facility. Other exposure pathways (e.g., garden produce, other meats, inhalation, incidental soil ingestion, and dermal exposure) were based on ground-level air concentrations at the respective communities. The methodology used to evaluate ground-level air concentrations to which cattle and grain are exposed was identical to the procedure used to evaluate ecological exposure. The methodology was based on the average concentration within a 36-square-mile area surrounding the facility. Estimated aggregated risks for the Three Forks School receptor under the cumulative condition were:

Most Likely Scenario Cumulative Condition Risks for Three Forks Residents

	Average Exposure	**High-End Exposure**
Beef*	2×10^{-8}	1×10^{-7}
Protected Produce*	7×10^{-10}	6×10^{-9}
Mother's Milk*	2×10^{-8}	2×10^{-7}
Other Foods**	1×10^{-8}	9×10^{-8}
Inhalation**	7×10^{-9}	3×10^{-8}
Dermal**	3×10^{-10}	1×10^{-8}
Soil**	8×10^{-9}	2×10^{-8}
Water**	7×10^{-11}	4×10^{-10}
Total	$\mathbf{7 \times 10^{-8}}$	$\mathbf{5 \times 10^{-7}}$

*Based on average ground-level concentrations over a region surrounding the facility.
**Based on ground-level air concentrations at the Three Forks School.

Aggregate risk from exposure to all COPCs for this scenario is below 1×10^{-5}. The highest risk for any one constituent is from exposure to dioxin based on beef ingestion and mother's milk ingestion, which equals 3×10^{-7} for the high-end exposure scenario and 4×10^{-8} for the average exposure scenario. Risk estimates for exposure to dioxin, and total risks, would increase if a smaller area of concern were used to evaluate beef ingestion. This is because, as previously stated, the methodology used to evaluate ground-level air concentrations to which cattle and grain would be exposed is based on the average concentration within a 36-square-mile area surrounding the facility. A smaller region (close to the facility) would have higher concentrations of pollutants. A larger region would allow lower concentrations of pollutants to be calculated into the average concentration and therefore yield a lower average exposure concentration for the larger region. The highest predicted risk for a smaller area would not exceed the risk predicted for the worst-case receptors.

Risks from Locally Caught Fish and Game

This section of the assessment evaluates risks associated with the consumption of fish and game obtained from the area around the facility. In proportion to the amount of fish and game that is

ingested, the risks associated with fish and game ingestion were used to replace the risks estimated for beef ingestion in other scenarios evaluated in the risk assessment.

River Fish - COPC concentrations in fish in rivers were estimated based on predicted COPC concentrations in the Belgrade Area and worst-case receptor location on the Missouri River. Risks from fish consumption are much lower than risks for other pathways (cumulative condition risk is 2 H 10^{-8} for the high-end exposure scenario and 1×10^{-9} for the average exposure scenario).

Lake/Pond Fish - Risks from consumption of fish from lakes and ponds were based on a pond in the Three Forks area. The estimated risk for the high-end fish consumption rate was 6×10^{-6}, and the estimated risk for the average fish consumption rate was 5×10^{-7}. For the high-end exposure scenario, about 60 percent of the risk was due to dioxin exposure (3×10^{-6}) and about 40 percent of the risk was due to PCB exposure (2×10^{-6}).

Locally Hunted Game - Risks from the consumption of game would vary depending on the total amount of meat an individual typically consumes and the percentage of the game meat that is derived from locally hunted deer that graze in areas surrounding the facility. Accounting for these variables, the predicted risks associated with the cumulative condition were estimated as follows:

Cumulative Condition Risk from Consumption of Local Deer

	Average Exposure	High-End Exposure
15% meat from area*	5×10^{-9}	4×10^{-8}
100% meat from area	4×10^{-8}	3×10^{-7}

*Model default value for beef ingestion.

Essentially all of the excess risk is predicted to occur as a result of exposure to dioxin because of its relatively high toxicity and bioconcentration characteristics.

Risk Conclusions

Metals, and to a lesser degree, organic constituents, are predicted to accumulate in soils as a result of continued long-term facility emissions. Accumulated concentrations after 70 years of emissions are expected to be below routinely detectable levels for nearly all COPCs. Zinc accumulation in soil is estimated to be measurable in less than 10 years of accumulation, for both the baseline and cumulative conditions, but remains below average background levels even after 100 years of accumulation. Under the baseline scenario only, polycyclic aromatic hydrocarbon (PAH) levels are expected to approach the detection limit within 10 years, but reach a dynamic equilibrium with naturally occurring decay rates and not increase in concentration with future emissions.

Acute and chronic exposure and hazards are below levels of concern. The HI for acute exposure under high-end exposure assumptions at the worst-case location is 0.4 for both the baseline and cumulative conditions. The HI for chronic exposure under high-end exposure assumptions at the worst-case location is 0.1 for the baseline condition and 0.2 for the cumulative condition.

At 2.0 µg/dL, the lead exposures at the worst-case receptor location resulting from facility emissions under baseline and cumulative conditions are below the 10 µg/dL standard used by the EPA to evaluate lead exposure nationally.

The estimated risks for the cumulative condition are essentially identical to the estimated risks for the baseline condition.

Cancer risk varies for the different scenarios evaluated. The highest risk is for a subsistence lifestyle scenario at the facility property boundary (cumulative condition risk of 1×10^{-5} for the high-end exposure condition and 2×10^{-6} for the average exposure condition). The lowest risks are for residents in Three Forks, Manhattan, and Belgrade who obtain their food from supermarkets (cumulative condition risk ranging from 2×10^{-9} for the average exposure condition at the lowest exposure location to 5×10^{-8} for the high-end exposure condition at the highest exposure location). Risks for the most likely scenario, residents in Three Forks who obtain some food products from the general area around the facility, either domestic or wild game, fall between these two extremes (cumulative condition risk of 5×10^{-8} for the average exposure condition and 4×10^{-7} for the high-end exposure condition). Total risk is dominated by consumption of predicted levels of dioxin in beef and mother's milk, and to a lesser extent by consumption of poultry and dairy products.

A majority of the people in the area are predicted to experience risks that are at or below the range that is generally considered acceptable (1 in 10,000 to 1 in 1,000,000). These risks are the incrementally increased risk of cancer as a result of lifetime exposure to COPCs from the site. The background rate of cancer from all sources (natural and anthropogenic) is 1 in 3. Certain types of land use and lifestyles close to the facility will result in larger incrementally increased cancer risk than would be experienced by the general population; for example, subsistence living or concentrated agricultural operations, such as feed lots, greenhouses, fish farms, or organic farms.

4.4 Ecological Risk

This section is a summary and analysis of the ecological risk assessment (ERA) produced for the Holcim Proposed Action (Portage Environmental, 2004). The ERA includes data sources and assumptions, an emission inventory and air dispersion summary, an exposure assessment, a toxicity assessment, and an ecological health risk characterization. Volume I of the ERA is attached as Appendix A of this EIS; Volume II of the ERA (spreadsheet tables) is available from DEQ by request. In addition, this section analyzes the potential impacts to ecological resources from the proposed action, based on the ERA. Ecological resources, in this case, include soil and water (streams, lakes, and groundwater), as well as biological resources (wildlife including game and non-game species, plants, and TES species).

4.4.1 Methods

The emission inventory was used in the dispersion modeling. Dispersion modeling was used to calculate ground-level air concentrations at several points surrounding the facility: at the point of maximum annual average concentration (along the facility boundary), at several terrestrial locations located within a 36-square-mile area surrounding the facility, and at two locations

along each of the Missouri, Jefferson, Madison and Gallatin rivers within a 15.6-mile radius of the facility. These locations were selected to evaluate worst-case risks, risks to the surrounding terrestrial community, and risks to aquatic life.

The emission inventory and air dispersion modeling results can be found in Section 4.2 and in Appendix B. The ERA applied the same procedures that were used in the human health risk assessment (Section 4.3) to predict concentrations of COPCs in media (e.g., lakes, streams, soils, vegetation). Exposure and risk to ecological receptors were calculated in general accordance with EPA protocols and guidance (EPA, 1999).

Development of the ERA was a multi-step process, involving:

- Estimation of ground-level air concentrations from Holcim stack emissions for the baseline condition (No Action Alternative) and the cumulative condition (Proposed Action) at representative locations and considering climatic factors (e.g., wind direction and speed) (see Appendix B). The emission inventory and exposure assessment were based on air dispersion modeling as reported in Appendix B of this EIS (Lorenzen, 2004).
- Calculation (modeling) of deposition and accumulation of COPCs on soil, vegetation, and surface water, based on the air concentration modeling and a 100-year period of deposition.
- Selection of representative species for study.
- Quantification of exposure to COPCs for each study species via applicable exposure pathways (e.g., inhalation, water ingestion, soil ingestion, and diet).
- Selection of appropriate screening criteria for comparison to predicted pollutant concentrations, and selection of toxicity factors for the representative species for the site-specific estimation of ecological risks.
- Quantitative evaluation of risks to representative species.
- Qualitative evaluation of uncertainty and variability.
- Summarization of the risks and making professional judgments regarding overall predicted ecological impacts.

4.4.2 Impacts of the No Action Alternative

The impacts of the No Action Alternative would remain below levels of potential concern.

4.4.3 Impacts of the Proposed Action

Exposure Assessment

This section describes concentrations of COPCs in soils and surface water, which were used in turn to calculate COPC doses for subject species per EPA guidance (EPA, 1999). In addition, the projected media concentrations were compared to both regulatory and non-regulatory standards as another measure of potential ecological risk.

Soil

Air deposition rates of COPCs were estimated based on ground-level air concentrations, and estimated soil concentrations were based on mixing into the uppermost soil, in accordance with

both EPA and CalEPA guidance, to determine concentrations. Accumulation of COPCs was modeled for a period of 100 years.

Maximum concentrations for each COPC were compared to detection limits of common laboratory analytical methods, as well as the following screening criteria for ecological health (see Table 3-1 in Appendix A for sources):

- Geometric mean U.S. background levels
- Toxicity Reference Values (TRV) for plants and soil invertebrates
- Ecological PRGs for the general environment and for plants
- Ecological Screening Values (ESV) developed by EPA Region 4
- Montana Aquatic Life Chronic Criteria and Trigger Values

Average soil concentrations for the broader area surrounding the facility do not exceed any comparison criteria (Appendix A, Table 3-1). For the location of highest predicted soil concentrations, manganese exceeds the detection limit, but not the screening level health criteria. Soil concentrations of inorganic mercury, selenium, and naphthalene, for both the baseline and cumulative conditions, are below detection limits and exceed some, but not all, of the screening level health criteria. Predicted concentrations of zinc at the worst-case location greatly exceed detection limits and several criteria.

Water and Sediments

Dry deposition rates for COPCs were calculated using ground-level air concentrations for various locations along the rivers. The air deposition rates, stream flow data from USGS records, and land cover data from satellite imagery, were used to estimate mixed concentrations of COPCs in surface water. COPC accumulation was modeled for a period of 100 years. Accumulation in streams was strongly affected by constant flows, which limit COPC residence time. Similarly, assumptions about residence time influenced COPC concentrations in lakes, ponds, reservoirs, and wetlands. Residence time is the average time for a water molecule to pass through the deposition zone. The edge of the study area along the Missouri River, about 3 miles from the cement plant, was used as the assessment point for rivers in the ERA, while the Three Forks area was selected as the assessment point for lakes. The total concentration of COPCs at the selected downstream river receptor point was conservatively estimated as the sum of the accumulated COPC concentrations in each of the river segments upstream of the assessment point within the study area. Concentrations of COPCs in sediments were predicted from maximum downstream water column concentrations, using EPA guidance.

Neither runoff from overland flow nor potential impacts to groundwater and groundwater recharge were modeled. These COPC environmental transport pathways were not considered to be important because of the small amounts of COPCs in soils and the limited rainfall received relative to upstream flow contributions.

Streams

Surface water flowing through the study area would acquire COPC concentrations that are orders of magnitude below regulatory standards or analytical detection limits. The overriding influence on this is the residence time of surface water moving through the area.

Lakes, Reservoirs, Ponds, Wetlands

Residence times for lakes, reservoirs, ponds, and wetlands can vary dramatically depending on: presence of an outlet; the rate of drainage through the sediments into groundwater; proximity to groundwater; runoff from the surrounding basin; evaporation rates; and various factors controlling partitioning of COPCs to sediments.

The Three Forks area was selected for this assessment because the area has many oxbow or pothole ponds. Pond water concentrations were estimated using the following assumptions for a hypothetical pond:

- Surface area is 126 m^2 (1,356 ft^2) and depth is 3 m (10 feet), for a volume of 378,501 liters (100,000 gallons).

- It takes a year to completely change the volume of water.

Selecting a shallow pond with little change over led to predicted COPC concentrations toward maximum likely levels. Locating the pond farther downriver, and closer to the stack, would increase predicted COPC concentrations, while locating the pond farther upstream and away from the stack would decrease predicted COPC concentrations. Keeping the pond equidistant from the stack, but moving it away from the upwind direction from the stack would result in higher predicted COPC concentrations in the water.

Wildlife were assumed to be exposed to COPCs when drinking water from the pond. The COPC concentrations in pond water would be higher than in the worst case for Missouri River water located downstream in the study area.

Groundwater

Impacts to groundwater were not analyzed in the ERA. Monitoring of groundwater in and around the facility has shown little or no impact from current operations (Bison, 2001).

Representative Species and Concentrations in Food

EPA guidance for ecological risk assessments includes the use of food web models to identify ecological receptors of concern in the ERA and to evaluate COPC exposure via food ingestion. The selection of representative species is necessary since testing a given project scenario against every species that might be found in a project area is not feasible and would not provide additional insight (EPA, 1999). EPA recommends different food webs based on the habitat type (short grass prairie, forest, scrub/shrub, freshwater, etc.). The food webs can be made site-specific by identifying local species where possible.

The model used in the ERA is based on the EPA shortgrass prairie food web and builds on the ERA submitted by Holcim as part of its permit application (Portage, 2004; Bison and Kleinfelder, 2004). Specific species were selected from the generalized food web for inclusion in the site-specific ERA. Species were selected based on expressed public concerns, availability of toxicity information, relevance to the local area, and food web bioaccumulation implications. For example, bald eagles, as avian carnivores, are not evaluated directly, but are represented in the ERA by the modeled avian carnivore, the red-tailed hawk. Amphibians were not modeled

due to a lack of available toxicity data. Deer were modeled as representative of large mammals. The ERA acknowledged the presence of species protected by the Endangered Species Act (ESA) and other regulations. No additional species were modeled as a result of their ESA status because of limitations in quantitative information to support the assessment, and because they are adequately represented by other species. Table 4.4-1 shows the EPA protocol terrestrial food web components and how they are represented in the ERA. Figure 3-1 in Appendix A provides a more complete representation of the food web used in the ERA.

Table 4.4-1 Representative Terrestrial Species Analyzed

Food Web Guild	Representative Species in ERA	Trophic Level[1]
Soil	Media concentration	NA
Terrestrial Plants	Qualitative analysis	1
Herbivorous Mammals	Rabbit (small); Deer (large)	2
Herbivorous Birds	Not analyzed	2
Invertebrates	Earthworms	2
Omnivorous Mammals	Not analyzed	3
Omnivorous Amphibians/Reptiles	Not analyzed	3
Omnivorous Birds	American Robin	3
Carnivorous Mammals	Red fox	4
Carnivorous Birds	Red-tailed hawk	4
Carnivorous Reptiles	Not analyzed	4

1Trophic Levels are as follows: 1 = plants; 2 = herbivores; 3 = omnivores; 4 = carnivores; NA = not applicable
Source: Portage, 2005

Toxicity Assessment

Ecological risk to species is determined by comparing projected COPC intake to published toxicity reference values. HI of 1.0 or greater indicates that the modeled species may be exposed to doses of COPCs high enough to represent a health risk. The HI incorporates the accumulated doses from inhalation, dermal contact, diet, water, and soil ingestion. The higher the HI, the higher the ecological risk becomes.

The ERA predicts similar outcomes for the baseline and cumulative conditions. Table 4.4-2 summarizes the HI results for the baseline condition, which are slightly higher than the HI results for the cumulative condition.

Results for Aquatic Species

All COPCs studied were within Montana surface water quality standards and are therefore unlikely to pose any danger to aquatic life in streams (Portage, 2005).

Modeling using the hypothetical pond described above, yielded projected COPC concentrations orders of magnitude higher than those predicted for streams in the area, but did not result in projected violations of water quality standards.

Results for Terrestrial Species

Terrestrial hazards were first evaluated with a simple comparison of predicted soil concentrations versus various screening-level criteria. This approach does not consider the site-specific

ecological characteristics surrounding the Holcim facility. It does provide a secondary assessment of potential ecological hazards. Estimated COPC concentrations in soils for the broader area surrounding the facility do not exceed any screening-level criteria for soils. At the worst-case location, predicted soil concentrations of selenium and mercury exceeded some of the screening level criteria.

The screening-level comparison criteria are conservative, health protective values that are applicable for use as screening values on a national or regional scale. They are intended to provide a simple method for determining if there is a potential for ecological hazard and the need for more thorough site-specific evaluation. The screening-level results for soil indicate a potential for ecological impact at the location of maximum impact, but not in the broader area surrounding the Trident facility.

The ecological risk assessment provides a site-specific assessment of potential ecological hazards. Using the predicted soil and water concentrations, the ecological risk assessment considers the types of species present in the area around the Trident facility and exposure via the food web.

Table 4.4-2 presents the quantitative results of the ecological risk assessment. The HIs in the area around the facility are all below 1.0, indicating no potential for ecological hazard. At the worst-case receptor (i.e., the point of maximum concentration), HIs greater than 1.0 were predicted for avian species, indicating a potential hazard at that location. The predicted hazard to avian carnivores is a function of predicted exposure to dioxin via soil ingestion. The predicted hazard to avian omnivores and herbivores is a function of exposure to various metals via earthworm ingestion.

Table 4.4-2 Summary of Ecological Hazard Indexes[1]

Species Class	Worst Case Receptors		Area Around Facility	
Representative species	**Baseline**	**Cumulative**	**Baseline**	**Cumulative**
Terrestrial Plants	.04	0.3	0.03	0.02
Aquatic Life - Rivers	NA	NA	0.0007	0.0007
Aquatic Life - Lakes	NA	NA	0.3	0.3
Aquatic Invertebrates - Rivers	NA	NA	0.0006	0.0003
Aquatic Invertebrates - Lakes	NA	NA	0.2	0.1
Terrestrial Invertebrates (worm)	0.4	0.3	0.03	0.02
Small Herbivores (rabbit)	0.08	0.06	0.04	0.04
Large Herbivores (deer)	0.03	0.03	0.01	0.01
Avian Carnivores (hawk)	7	7	0.4	0.4
Mammalian Carnivores (fox)	0.01	0.007	0.0008	0.0006
Avian Omnivores and Herbivores (robin)	1	1	0.08	0.07

1 Higher HI=higher ecological risk; HI greater than or equal to 1 is considered an ecological risk (EPA, 1999)
NA Not applicable Source: Portage, 2005

Conclusions

The ERA found that 1) under either the No Action or Proposed Action alternative, air emissions from the Trident facility may pose a potential ecological hazard to some species at the point of maximum air concentrations; 2) any ecological risks would be restricted to small areas and would not have a significant impact on the overall ecological health of the broader region surrounding the Trident facility; and 3) there is very little difference in ecological risk between the two alternatives.

4.5 Land Use

This section describes the types of impact that would potentially occur to land use resources from the No Action and Proposed Action alternatives. Mitigation measures that may be used to reduce impacts to land use resources are discussed in Section 4.11.

4.5.1 Methods

4.5.2 Impacts of the No Action Alternative

The No Action Alternative would have no impact on land use in or around the plant site. Existing land uses would continue. These land uses would be mostly agriculture and recreation.

4.5.3 Impacts of the Proposed Action

Construction

Proposed physical changes of the Proposed Action involve on-site tire storage and modification of the kiln to allow for the insertion of tires. This would consist of a tire conveyance system, a mid kiln injection system (gate), and storage trailers. Construction activities associated with the Proposed Action would take place on previously disturbed industrial land within existing plant property. The plant is not accessible to the public. Land use outside of plant property would not change as a result of these construction activities.

Onsite land disturbance impacts from construction of the kiln modification and installation of other equipment at the plant would be minor and temporary. The actual kiln modification would require additional equipment and specialized personnel and would represent only a minor increase in industrial and commercial activity in the area. As such, the impact to industrial and commercial activity would be temporary and minor.

Operation and Maintenance

Agriculture

Land uses in the local area would continue to be farming, ranching, and livestock grazing. The proposed use of waste tires would occur within a previously disturbed mining/industrial cement manufacturing facility.

The Montana Department of Agriculture has adopted the federal organic farming program (National Organic Program) for certifying and supervising organic farms and farm products. Neither the National Organic Program nor the USDA has developed organic farming standards for metals or organics in soil or water. Other federal agencies have standards for metals and organics in soil and water; however, the standards relate to the application of pesticides, not to organic farming.

The potential impacts of the Proposed Action to agricultural uses in the vicinity of the plant site can be accounted for in the risk assessment model with estimates of pollutant concentrations in the soil. Soil concentrations change over time, and the risk assessment uses average concentrations over a 100-year period. Lower soil concentration default values created by the model were used to estimate potential impacts of the Proposed Action. The food pathways dominating the risk estimates are a function of estimated soil concentrations. All predicted soil concentrations are below preliminary remediation goals based on residential exposure.

Parks, Recreation, and Preservation Areas/Tourism

The project would not result in a loss of recreational opportunities to the public. Recreational opportunities would continue on land in the vicinity of the plant, along the Missouri River, and within the Missouri Headwaters State Park. As a result of the upcoming bicentennial celebration of the Lewis and Clark expedition, more recreational visitors would be expected to visit the Missouri River, its tributaries, and the Missouri Headwaters State Park. However, the Proposed Action would not likely alter any existing access to, or displace, recreational activities.

Reasons for public participation in outdoor recreation activities vary and may include the following: for fun, relaxation, health and exercise, family togetherness, to experience nature, reduce stress, teach good values to children, be with friends, excitement, learn new skills, be alone, or for competition (Roper Starch, 1999). Because of personal preferences, as well as other reasons (economy, fires/drought, climate/weather, cost of gasoline, etc), it is difficult to determine how the Proposed Action would impact recreational use/tourism in the area. The Proposed Action would be located on land that is already industrial. Throughout the last decades when tourism and industry have both grown (refer to Chapter 3.11 for details), the varying land uses and users have existed together. Because the Proposed Action would not alter the study area's land use pattern or result in a loss of recreational opportunities for the public, the Proposed Action is not expected to have a major impact on recreation and tourism.

4.6 Transportation and Public Services

4.6.1 Impacts of the No Action Alternative

The No Action Alternative would not change the existing traffic patterns or public services in the plant vicinity.

4.6.2 Impacts of the Proposed Action

Construction

Construction activities involving the modification of the kiln and installation of other equipment at the plant would require delivery of materials and equipment to the site. Roadways and the

railroad track located within the plant site would require some upgrading and spur road construction to allow access of covered trailers and equipment into the proposed storage site.

The plant access road is surfaced with asphalt pavement. Roads around the immediate vicinity of the plant are designed to carry heavy equipment. Other service and maintenance roads within the plant site would be surfaced with crushed rock, and would be designed for heavy haul trucks. A 0.5-acre construction parking lot and a storage area covered with crushed rock would be provided for construction trailers, tools, vehicles, equipment, and material.

Construction vehicle traffic would primarily use existing paved and non-paved roads. The amount of vehicle activity in the area is not expected to increase substantially over the existing traffic, and the potential impacts from traffic would be minor and of short duration.

Operation and Maintenance

Waste tires would be transported to the plant site in enclosed trucks or by rail to a quarry. Incoming trailers of tires would be weighed at the plant scales. To maintain a consistent supply of waste tires for the facility, Holcim would likely rely on a contractor to collect and deliver the tires from Montana or neighboring states. Sources of these tires could include new tire dealers, auto dismantlers and recyclers, auto service centers, and landfills.

The Proposed Action would result in an increase in traffic in the vicinity of the plant. An increase in accidents that accompany increased traffic volumes could occur. Additional traffic would be minor in relation to the overall day-to-day traffic in the area. Vehicle traffic would primarily use existing paved and non-paved roads within the plant site. Access roads to the plant site are paved, so fugitive dust emissions from off-site traffic would be kept to a minimum.

Holcim has estimated that the increase in traffic between the East Three Forks interchange and the plant would be about 1,300 trucks per year, an average of approximately 3.6 trucks per day or a 0.5 percent increase in traffic. As long as the trucks hauling tires to the plant are legally loaded, the 3.6 trips per day would not be an issue with the Montana Department of Transportation (MDT). Holcim would not need to submit a traffic study to MDT (Ebert, 2004).

According to the MDT Statewide Transportation Program 2004-2006 and discussions with Butte District 2 staff, the East Three Forks interchange is scheduled to be removed and replaced in the future. Tentative plans indicate that a contract will be awarded for construction in February of 2007. The project was originally nominated as a safety project because of limited sight distances on the ramps and structure. This project would likely affect the Proposed Action as traffic on Interstate 90 is expected to be diverted around the East Three Forks interchange during construction (Christensen, 2004).

Tires could be delivered by train. If rail transport is used, it is expected that Montana Rail Link would be able to coordinate transport and unloading activities without adversely affecting its system.

4.7 Socioeconomics

This section addresses the socioeconomic impacts of the Proposed Action.

4.7.1 Inventory Methods

Most of the impact information in this section, including property tax impact, tax incentive, financial impact, and impact on local government services (including police and fire protection and emergency medical), was gathered through telephone surveys. Operational impact information about the proposed system was provided by Holcim. A report about managing waste tires in Montana (Environmental Quality Council, 1998) also was consulted in the preparation of this section.

4.7.2 Impacts of the No Action Alternative

There are no new impacts associated with the No Action Alternative. There would be no change in the current operation, which would result in no local, county, state or tourism impacts.

4.7.3 Impacts of the Proposed Action

Construction Impacts

Construction is likely to be completed with personnel and resources already employed at the facility. Holcim estimates that it would take four to six months for equipment to be manufactured after a purchase order is issued. One month would be needed for site preparation. An additional five to ten days would be required for the equipment installation (personal communication, Nicole Prokop).

Operational Impacts

Fuel Cost Savings

Annual fuel cost saving attributable to the use of tires as fuel was estimated at $236,814. A more detailed discussion of that cost savings is found in Chapter 1.

Tire Source, Tire Cost and Tire Delivery

Holcim proposes to incinerate up to 1,137,539 tires annually. The EPA has estimated that one waste tire is generated per person per year in the United States (EQC, 1998). More than 917,600 scrap tires potentially would be generated annually in Montana, according to the EPA ratio and the July 2003 population estimate of 917,621 persons (U. S. Census Bureau, 2004).

Holcim indicated that the source of waste tires is undetermined at this time. It does not have a secure contract with a tire supply source because it does not have a permit from DEQ. The cost of scrap tires could not be determined because Holcim does not have a secure source for the scrap tires. Similarly any disposal fee paid to Holcim for taking scrap tires could not be determined because the company does not have a permit or secure tire source. Holcim reported that waste tires would be delivered to its facility in enclosed trailers shipped by truck or rail (personal communication, Nicole Prokop).

Property Tax Impacts

Current Assessed Valuation of the Facility

The 2004 assessed valuation of the Holcim facility is $24,507,700, with equipment appraised at $17,670,400 and real property appraised at $6,823,500. The total assessed valuation also included an assessment of about $13,830 for pollution control. In 2003, Holcim paid $315,700 in property taxes. About three-fourths of that total ($238,330) went to Gallatin County and its service districts. The remaining one-fourth ($77,370) went to the State of Montana for its public education fund (personal communication, Bonnie Ambuehl).

For 2004, Holcim paid $340,000 in property taxes. Holcim also paid a Net Proceeds Tax of $135,000 to the State of Montana, based on the gross yield of value of proceeds from limestone extracted. Holcim also paid $76,000 for the Montana Producers Tax for gypsum or cement produced (personal communication, Nicole Prokop).

Future Assessed Valuation of the Proposed Facility

The estimated value of the proposed whole tire feeding system is $1,000,000. The $1,000,000 in additional equipment would generate $14,200 in real property tax. About $10,720 would go to Gallatin County and its service districts, with the balance of that tax (about $3,480) going to the State of Montana (personal communication, Bonnie Ambuehl).

Tax Incentive

No financial incentives are available to Holcim from the state to use waste tires as fuel. A fee of $0.27 per ton would be charged by DEQ for importing and incinerating waste tires (personal communication, Mike DaSilva).

Impact on Gallatin County Landfill

The impact of incinerating waste tires at Trident on the revenue generated by scrap tires at the Gallatin County landfill is expected to be minimal. Currently, that facility accepts 400 to 500 waste tires annually. A fee of $48 per ton is charged to dispose of waste tires at that facility. Using an estimated maximum of about 99 tires per ton, the revenue generated from accepting tires at the Gallatin County landfill ranges between about $195 and $250 annually.

Impact on Existing Waste Tire Facilities

There are four privately operated tire-only landfills in Montana. Those facilities are licensed by DEQ to dispose of and recycle scrap tires. The facilities are located near Kalispell, Polson, Hot Springs and Silesia near Billings. Other landfills accept tires along with other solid waste.

A survey done by the State of Montana in 1997 (EQC, 1998) developed revenue estimates for those facilities (Table 4.7-1). Scrap tire disposal rates ranged from a low of $0.75 per tire at the Rasmussen facility to a high of $5.00 per tire at Tires for Reclamation. The price range per tire depended on the type of tire, with lower rates charged for passenger car tires and higher rates for heavy equipment tires. Nearly 175,000 tires were accepted at the three facilities in 1997. In that same survey, it was estimated that the discrepancy between the number of scrap tires disposed of at landfills (300,483 scrap tires) in 1997 and the estimated 800,000 scrap tires generated in

Montana that same year, was probably due to several reasons including reporting gaps, land owner landfill exemptions, and illegal disposal.

Table 4.7-1 1997 Revenue Generated by Tire Disposal at Existing Facilities

Facility	Location	# Tires Accepted	Price Range (Per Tire)
Rasmussen	Kalispell, Montana	33,400	\$0.75 to \$1.25
Tire Depot	Polson, Montana	65,000	\$1.00
Tires for Reclamation	Billings, Montana	76,097	\$1.00 to \$5.00
Total Tires		174,497	

Sources: Intermountain Demographics
EQC, 1998

The impact of Holcim using waste tires as fuel cannot be determined until Holcim is able to secure a contract with a scrap tire supply source. The impact of the proposed project on existing tire-only landfills will depend on the source of scrap tires. Businesses that recycle tires into other products were not considered because of the comparatively small number of tires they use.

Holcim's annual demand would be for up to 1,137,539 scrap tires. It is estimated that about 917,621 scrap tires are generated in Montana annually. The difference between the number of tires needed by Holcim, and the number available in Montana, would have to be imported from out of state.

If all 1,137,539 scrap tires would be acquired from out–of-state sources, state tire-only landfills would not be affected. Impacts to businesses that recycle tires into other products would not be affected, as their local sources would remain the same.

Holcim, or its tire contractor, could acquire scrap tires in two ways. Holcim could acquire tires from the existing tire-only landfills, and the impact on those landfill operations would be minimal. Until a cost per tire has been negotiated, the revenue impact on tire-only landfills cannot be determined. There could be a land capacity savings at existing tire-only landfills if the scrap tires were sold and shipped to Holcim instead of being disposed of at the landfills.

Holcim could compete for tires with the tire-only landfills. Competing to acquire scrap tires in state would have a direct adverse impact on revenue generated at the three facilities, with secondary impacts on employment and wages at the tire-only landfills as well as property taxes attributable to those landfills.

Impact on Local Units of Government

Emergency Services

The greatest impact from the proposed system would be on emergency services, including police and fire protection and emergency medical.

Gallatin County Sheriff's Office

The impact on the sheriff's department would depend on the method of scrap tire delivery to the Holcim facility. Rail delivery of scrap tires would have no impact on the department.

Additional truck trips on the road leading to the Holcim facility would impact the sheriff's department. That truck traffic in the area would lead to more traffic enforcement issues (personal communication, Jim Oberhofer). In the summer, State Secondary Route 286 is used by tourists traveling to the campground and information center at Missouri Headwaters State Park. At proposed levels of truck traffic, an additional 3.6 trips per day, the traffic impact on the roadway would be manageable. No additional new personnel or equipment would be needed.

Three Forks Fire District

The proposed project would have a minimal impact on fire protection and suppression in the western portion of the county. The risk of a fire starting at the tire storage area is minimal because scrap tires would be stored in containers in a limestone quarry. There are no other sources of fuel for a potential fire in the quarry. Any tire fire would be suppressed as described in Section 2.3.3.

The department has a one-year-old fire truck that would be used to respond to fires. Members of the department are volunteers and would need additional training (personal communication, Bruce Felz).

Three Forks Area Ambulance Service District

Impact on current ambulance services also would be minimal. There would be no additional hiring or equipment purchase as a result of the proposed project. According to the chairman of the ambulance district, the ambulance has been dispatched to the existing Holcim facility less than a half dozen times in the last 18 years. Any impact on the ambulance district would be due to additional truck traffic on the road. That impact is expected to be minimal (personal communication, Bill Frank).

4.8 *Property Impact Assessment*

DEQ commissioned a study to evaluate whether property values would be impacted if Holcim's proposal to burn tires is permitted (Delacy, 2004).

The study examined relevant literature and research dealing with measurement and evaluation of the likelihood of negative property value impacts from land uses or events that may be perceived as adverse. It explored other types of externalities or events that may or may not affect property values, and it documented the impacts that have been demonstrated. The study analyzed the history, patterns of land use, and current property values in the project area, and sought to determine whether the Trident cement plant may have impacted property values over time. The hypothesis tested was: if property values have been impacted adversely over time, then overall rates of appreciation in property values will be measurably lower, or even negative, compared with otherwise similar communities unaffected by such an influence.

The study also looked at Holcim's cement plant in Devils Slide, Utah, about 30 miles east of Ogden. In 1996, Holcim started burning tire derived fuels and other waste at the Devils Slide cement plant. This study tested the trending of property values before and after the introduction of tires at the Devil's Slide plant to see if any measurable negative property value effects could be discerned. Similar analysis was performed for three other cement plants at Inkom, Idaho near

Pocatello, Davenport, California, a coastal site near Santa Cruz, California, and a plant near Durkee, Oregon. The latter two cement plants burn tires as part of their fuel mix.

The study area for the Trident plant was defined at radius intervals of 10-, 25-, and 50-km (6.2-, 15.5- and 31-miles, respectively) from the Trident plant. The study area includes property in adjacent Broadwater County, areas as well as in nearby Jefferson, Madison, and Meagher counties.

Land use within the 50-km (31.06-mile) study area was inventoried using data from the Montana Natural Resources Information System (NRIS). Of the 1,929,652 acres encompassed by the study area, 79 percent is in private ownership, 16 percent is managed by the federal government, and the balance is owned by the state. The area lying within a 10-km (6.21-mile) radius of the Trident plant includes 77,000 acres of which 88 percent is in private ownership.

Data on crop types grown, acres under irrigation and number of head of livestock are reported only at the county-wide level. Three types of agricultural land are found: pasture and irrigated and dry cropland. Less than 15 percent of the land in the 10-km (6.21-mile) study area is classified as important farmland by the Montana Department of Natural Resources and Conservation.

A major utility corridor traverses the study area. It includes Interstate 90, State Secondary Route 205, Montana Rail Link, the Trident-Belgrade 50 kV transmission line, and additional lines owned and operated by NorthWestern Energy.

The cement plant at Trident has been in continuous operation since 1910, with construction beginning as early as 1908. The plant is at least contemporaneous with, if it does not predate most settlement of the area. The current configuration of the plant has been in place since 1973.

The Trident plant is located in a remote rural area at least five miles from any suburban fringe development and about 7 miles northeast of the town of Three Forks. The study inventoried all the affected parcels within a two-mile radius of the 1,180 acre Holcim holdings. This inventory identified 29 discrete tax lots in Gallatin and Broadwater counties, comprising over 8,000 acres with a total of five structures.

Three organic farms were identified between 25 and 50 km (15.53 and 31.06 miles) from the Trident plant. Two of the farms are less than one acre in size and lie on the suburban fringe of Bozeman. The third is a 350-acre organic hay farm northeast of Belgrade.

4.8.1 Methods

Every parcel of real estate is unique given that it is fixed in place, in finite supply, immobile, durable and of use to people (Appraisal Institute, 2003). The behavior of market participants is as determinative of price as physical attributes of the property. Outside factors, or externalities, can adversely affect property value (Appraisal Institute, 2003). Diminution in property value from some defect is typically measured on a cost-to-cure basis. When there is no demonstrable physical risk, such as direct contamination of a property, value can still be adversely affected by stigma and perceived risk. Stigma is the failure of a property to recover its value once a defect is cured.

Property value impacts created by an external incident or environmental factors can be measured through development of a hedonic model. For the model to function accurately, a data set must be established that is sufficiently large and homogeneous to isolate the impact influence within acceptable levels of variance.

Ideally there would be a body of data consisting of properties that had recently sold in rural areas influenced by a cement plant burning tires as fuel, to compare with another set of sales in otherwise similar areas without such influence. Further, these observations would involve otherwise similar properties so that the difference in transaction prices could be attributed to the influence, positive or negative, of the nearby location of the cement plant. The collection of these so-called “paired sales” might provide an appraiser sufficient information to derive a measure of diminution or enhancement attributable to the suspected influencing factor. I is clear that a list of distorting elements grows as the appraiser takes into account how different one property might be from another.

The paired sales technique is commonly used by appraisers to derive appreciation calculations. Sales and resales of properties are paired with any change in price attributable to passive appreciation or depreciation. The appraiser must adjust for any changes to the property, over time, between the sales.

A hedonic model provides an alternative approach for estimating the change in value that an undesirable land use may cause. The hedonic regression of sale prices, with a set of characteristic attributes (including one for distance from the undesirable use), can then be used to predict the probability of adverse impact that a similar use in the subject location might have. Simply put, the hedonic model applies a statistically rigorous process to the paired sales technique to explain price differences for varying features.

The hedonic model attempts to sample randomly from a large population of observations. The model works best in mature urban areas. The key is to hold as many variables as possible constant to better gauge what affects house values. Alternatively, a control area may be selected with a similar population of properties, but in an area considered unaffected by the particular variable.

In this case, such a model would require a significant sampling from a large homogenous population of comparable property sales in areas with cement plants, before and after a change in the fuel mix.

For the Holcim/Trident analysis, no large data pool was available because of the remote rural location. Instead hedonic models developed in urban areas were studied to derive some boundaries beyond which impacts had no effect. The same models also set bounds on the severity of impact that might be anticipated. Finally, individual parcels were identified and analyzed for potential risk of diminution in value.

Some statistical analyses were applied to test whether the presence of a cement plant had an adverse impact, even before the fuel mix change was announced. Linear regression was used to track overall property appreciation rates for various communities. The general impact of a cement plant was tested, and then a test case was selected where a tire derived fuel mix had been introduced some time ago. Before and after appreciation trends were developed to see if there

had been any negative impacts within a 50-km (31.06-mile) radius. This trending would help resolve whether property values might be affected by the proposed fuel change at the Trident facility.

First, only residential sale data can be used because other property types have too much variability. Residential properties are most sensitive to environmental impacts.

Second, any one or a combination of external factors can swamp the influence attributed to a particular undesirable land use. These externalities include, but are not limited to: local employment opportunities, the costs and availability of mortgage funds or the presence of offsetting amenities (like a view or water frontage). For example, demand for homes on golf courses remains high even though there are risks from striking golf balls and noise from sprinkler systems.

If property values can be shown to be appreciating even where there is knowledge of some risk, or where some blight is readily apparent, then it is very difficult to argue property values have been diminished by that effect. Therefore, data were collected from local multiple listing sources and trended over time. Because it has been almost four years since the announcement of the fuel mix change and the application for an air emission permit, appreciation trends could be created before and after the announcement.

Larger macro-economic indicators and anecdotal observations from local experts were collected. Academic literature was studied regarding impacts on property values created by changes in land use or some stigmatizing event. Other western state locations where cement plants that burned whole tires or processed tires, had a chance to impact surrounding property values were identified and inspected.

Finally, an inventory of parcels lying within a two-mile radius of the Trident plant was created. Each parcel was described by tax number, owner, land use, water rights, structures, and potential visual relationship to the cement plant. According to research literature, a two-mile radius is the outer bounds (at least in an urban context) beyond which undesirable land uses cannot be shown to have a measurable negative impact.

Recent rural property sales were analyzed to scope the general magnitude of property value in the affected area and establish some benchmarks to better understand when and if adverse impacts might occur with the proposed fuel mix change.

4.8.2 Impacts of the No Action Alternative

There are no property impacts associated with the No Action Alternative. The plant has been in the present location for ninety-five years and predates most settlement in the area.

4.8.3 Impacts of the Proposed Action

Housing Prices

Population growth and steady appreciation of property values suggest that Gallatin County and the town of Three Forks have been unaffected by the Holcim Cement plant operations.

Table 4.8-1 Population of Counties in Affected Area 1950 to 2000

	2000 CENSUS	% Growth 1990-2K	1990 CENSUS	% Growth 1980-90	1980 CENSUS	% Growth 1970-80	1970 CENSUS	% Growth 1960-70	1960 CENSUS	% Growth 1950-60	1950 CENSUS
MONTANA	*902,195*	*12.91%*	*799,065*	*1.57%*	*786,690*	*13.29%*	*694,409*	*2.91%*	*674,767*	*14.17%*	*591,024*
COUNTIES											
BROADWATER	4,385	*32.16%*	3,318	*1.56%*	3,267	*29.33%*	2,526	*-9.91%*	2,804	*-4.04%*	2,922
GALLATIN	67,831	*34.42%*	50,463	*17.73%*	42,865	*31.87%*	32,505	*24.80%*	26,045	*18.92%*	21,902
JEFFERSON	10,049	*26.58%*	7,939	*12.95%*	7,029	*34.19%*	5,238	*21.90%*	4,297	*7.05%*	4,014
MADISON	6,851	*14.39%*	5,989	*9.93%*	5,448	*8.66%*	5,014	*-3.78%*	5,211	*-13.12%*	5,998
	89,116	*31.62%*	67,709	*15.53%*	58,609	*29.43%*	45,283	*18.06%*	38,357	*10.11%*	34,836
% of MT Population	9.88%		8.47%		7.45%		6.52%		5.68%		5.89%

Table 4.8-1 shows population statistics for the four affected counties, compared with the state. It demonstrates what local brokers and appraisers attest: the Gallatin Valley is, and has been, the fastest growing area of Montana for well over thirty years. During all that time Holcim, and its predecessors, have operated a cement plant at Trident.

Similarly, the population of Bozeman has increased 37 percent since 1990 to 29,459 residents (or better than 3 percent per year), while Belgrade increased 93 percent to nearly 6,600 residents in the same period. Three Forks currently has a population of 1,775, a 47 percent increase from 1990 or an increase of just less than 4 percent per year. Manhattan also grew at a 3 percent annual rate from 1990-2002.

Thus, there is no evidence, based on these population growth statistics, that the presence of the cement plant has limited the general popularity of the affected area. Some academic studies, however, suggest that property values become subject to diminution if there is attendant publicity to a perceived risk (McCluskey and Rausser, 2001). The literature emphasizes the importance of publicity in creating a stigma, even when there is no actual property damage created. Sometimes, the perception of risk is sufficient to adversely affect values.

Therefore, the analysis looked at trends in property values before and after the Holcim fuel change announcement and application for modification of its air quality permit to DEQ in 2001.

Montana is a non-disclosure state, so county assessor offices could not be used to confirm sale data. However, The Gallatin Association of Realtors collects multiple listing statistics. The average price of homes sold is reported quarterly for the entire county, as well as for the towns of Three Forks, Belgrade, and Bozeman.

Table 4.8-2 Housing Appreciation-Gallatin County, Bozeman, Belgrade, and Three Forks

Year	Bozeman	App.	Belgrade	App.	Three Forks	App.	Gallatin County	App.
1996	$132,427	*	$108,945	*	$82,223	*	$127,972	*
1997	$133,588	1%	$113,362	4%	$83,762	2%	$125,837	-2%
1998	$140,285	5%	$118,320	4%	$90,550	8%	$135,780	8%
1999	$147,738	5%	$120,783	2%	$90,098	0%	$135,403	0%
2000	$172,479	17%	$129,311	7%	$91,600	2%	$161,609	19%
2001	$186,309	8%	$141,068	9%	$102,300	12%	$178,980	11%
2002	$190,677	2%	$149,735	6%	$99,189	-3%	$183,482	3%
2003	$210,150	10%	$159,947	7%	$114,581	16%	$193,308	5%
Total Appreciation		**59%**		**47%**		**39%**		**51%**
Average Annual Appreciation		**7.3%**		**5.9%**		**4.9%**		**6.4%**
Median Income	**$32,156**		**$37,392**		**$34,212**		**$38,120**	

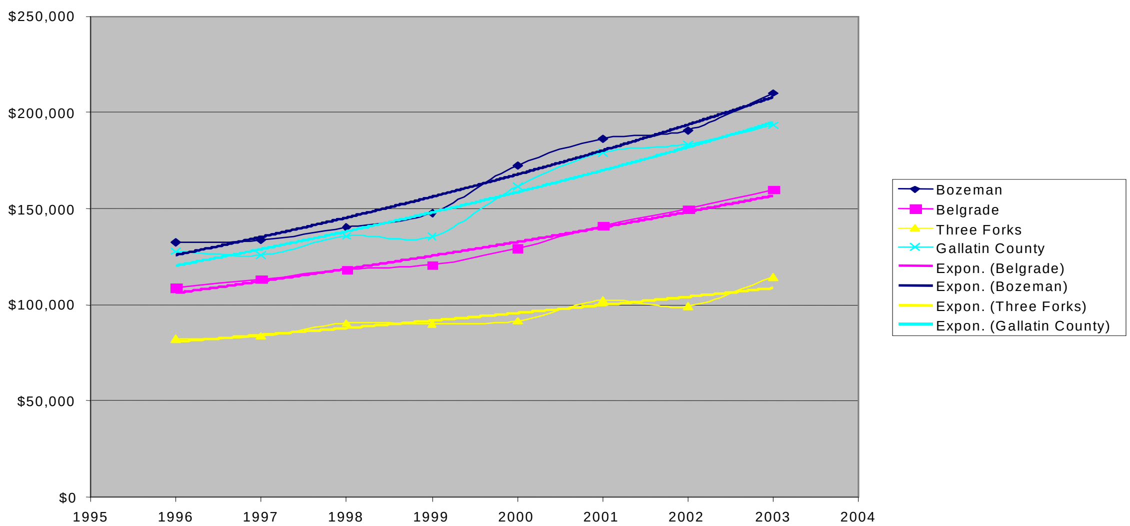
These observations were aggregated into the annual average price of homes sold (Table 4.8-2) and were graphed, (Figure 4.8-1) calculating relevant statistics. Figure 4.8-1 shows that property values have trended up at 6.4 percent per year in Gallatin County going back eight years to 1996.

Three Forks trended up 4.9 percent annually. The fact that Bozeman (7.3 percent) and Belgrade (5.9 percent) report marginally higher appreciation rates than Three Forks is likely not a function of proximity to the cement plant so much as their being larger towns with higher household income and other demographics, which also influence home values.

The community of Three Forks thus shows a long-term positive appreciation rate, but at a slightly lower rate than more urban parts of the county. If the cement plant created any negative impacts on value, one indicator would be a significantly slower rate of property value appreciation. The data do not show it.

Figure 4.8-1 plots regression lines trending the average prices of homes sold for Gallatin County, Bozeman, Belgrade, and Three Forks. Three Forks is the community most directly affected by the Trident plant, while the other two communities fall into the 25-km and 50-km (15.53 and 31.06 mile) study areas, respectively.

Figure 4.8-1 Housing Appreciation-Gallatin County, Bozeman, Belgrade and Three Forks



Farm Land Values

The consensus in the academic literature is that indirect adverse impacts to property values from undesirable land uses are confined to a two-mile radius from a given source of concern. At issue here is whether an indirect impact can be measured.

Farmland, because of its expanse and relatively low unit values compared to urban land, has seldom been found to be affected by structures or emissions, so long as no material damage can be shown. Transmission line studies suggest a small negative effect in rural areas, but these negative effects have been to a second home leisure use rather than agricultural use (Kroll and Priestley, 1992).

Studies have suggested that the perception of risk may create stigma or adversely affect property value in areas with urban populations. Therefore, absent any reliable study in rural areas and given the fact that 29 parcels have been identified within a two-mile radius; a more site-specific analysis was performed.

Table 4.8-3 lists the non-Holcim-owned acreage lying within a two-mile radius of the plant in Gallatin and Broadwater counties. In Gallatin County there are 311 acres of prime irrigated farm land and 216 acres of dry pasture. The balance is non-arable. There are five structures not owned by Holcim. None of these is an owner-occupied residence. Residences constructed for farm labor or tenants are not considered susceptible to adverse impacts the way an owner-occupied dwelling is. Such a rental dwelling serves more of a utilitarian rather than an esthetic function.

In Broadwater County, on the west side of the Missouri River, there are 1,680 acres of arable land. There are no residential structures in Broadwater County that are within the two-mile radius, or within sight of the cement plant.

Table 4.8-3 Non-Holcim Owned Acreage within Two-Mile Radius of Trident

Gallatin County Map/Parcel No.	Acres	Prime if irrigated (acres)	Important Farmland (acres)	Structures
2N2E 15				
RDD11714	429.7	150.4	128.9	3
RDD40137	71.9		7.2	
RDD43332	122.6	12.3	12.3	
2N2E 14				
RDD40137	8.9		3.5	
RDD4328	161.1	96.6	16.1	
RDD 11708				1
RDD 43325				1
2N2E 11				
RDD43327	174.0	52.2		
2N2E 2				
RDD84	640.0		48.3	
Broadwater County				
Acreage within buffer	8,729.0			
Prime if irrigated acres		420.0		
Important Farmland			1,260.0	
Urban Area	0.0			
Urban Parcels	0.0			
Totals	**10,337.2**	**731.5**	**1,476.3**	**5.0**

Local appraisers and real estate brokers report no observable impacts attributable to either the plant, or the announcement of a fuel change. Pat Asay, Director of Lands and Permitting for NorthWestern Energy in Butte, was interviewed regarding land values and possible impacts of the Trident plant before and after the announcement of the fuel change (personal communication, Pat Asay).

Mr. Asay, an MAI appraiser, lives in Manhattan, a small town just beyond the 10-km (6.21-mile) study area radius from Trident. He is well acquainted with the plant and property values in the area. His office completed a comprehensive inventory of land sale activity between Three Forks and Four Corners, associated with a utility corridor of about 29 miles. As part of the process of acquiring right of way, land sale activity was researched throughout Gallatin and Broadwater counties.

Mr. Asay and his staff have identified eleven “arms length transactions” within ten years (appraiser terminology for a bona fide market sale between two knowledgeable independent parties, neither acting under duress) involving agricultural land within a 25-mile (40-km) vicinity of Three Forks. Smaller tracts that can be partitioned for rural residential use can command prices in the $1,800 to $2,000 per acre range. Irrigated farm land sells in the $1,000 to $1,500 per acre range, while dry pasture is valued in the $500 to $800 per acre range.

Mountain views, access and frontage on a stream or lake command premiums for rural or recreational residential use. The limestone bluffs surrounding Trident afford few such

opportunities, and, according to Mr. Asay, values are commensurately lower, but the values are not lower because of the cement plant.

Whereas residential property is sensitive to nuance, reputation and other intangibles, farmland is bought and sold based on its productivity and utility. Even demonstrable contamination would not necessarily diminish property value if a satisfactory cleanup could be undertaken (McCluskey and Rausser, 2001).

Farmland loses value if water rights are lost or if its soil loses productivity because nutrients have been exhausted. In some arid areas, farmland loses value when too much irrigation begins to cause salts to rise to the surface poisoning the crops. Low valued farmland or rangeland is typically bought and sold as large tracts, where residential use is incidental to the farming activity. The presence of transmission towers, windmills, power lines, or any other structure or use does not adversely affect value because the parcels are too large, with too low a unit value, to be sensitive to that type of influence.

Conclusions

The research, evaluation and analysis found that property values, in general, are resilient, particularly when there is sustained population growth. The value of large parcels in agricultural use (multiple acreages) was far more likely to be affected by production and transaction factors (like availability of water and the costs of mortgage financing) than subtle changes in air quality. Property values in rural areas will be most affected by local employment opportunities.

Rural land values in the Gallatin Valley have appreciated consistently, over the years, as might be expected from population growth along I-90. A NorthWestern Energy transmission line is being built in a corridor between Three Forks and Four Corners. Rural land values have been extensively reviewed in the area by that company in order to acquire rights-of-way. There, land value is affected by the usual factors such as soil quality, availability of water rights and relative proximity to urban services. Thus, land value within a 10-km (6.21-mile) radius of the Holcim/Trident plant might be lower, but not because of any influence by the plant, but because of poor soils or lack of water.

The evaluation and analysis also found that there is no empirical evidence to support concerns that property values will be adversely affected by the proposed change in the fuel mix at the Holcim/Trident cement plant. This conclusion is contingent on the ongoing maintenance and safe performance of the facility and its compliance with applicable regulations and operating procedures.

Tire storage will be confined to truck trailers parked out of public view, in an adjacent limestone quarry. The tires will not be stored outside in the elements and the quarry location is well within Holcim's property boundary. Therefore, there would be no visual impact associated with this storage method. The occasion of parked trailers and containers at industrial sites is common and relatively unobtrusive given an area well established with industrial activity. Tire storage at the Trident plant will not affect surrounding property values.

4.9 Irreversible & Irretrievable Commitment of Resources

Construction and operation actions of the project could result in either the irreversible or irretrievable commitment of certain resources. Irreversible commitments are essentially

permanent. The term applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time. Irretrievable is a term that applies to the temporary loss of production, harvest, or use of natural resources.

The project would result in an irreversible and irretrievable commitment of resources from direct consumption of materials used during construction (kiln modification and tire conveyance system) and operations. This resource commitment includes fuel to operate equipment, and equipment created for the project that would not be usable or recyclable at the end of the life of the project.

Water resources would also be consumed during the construction and, to a lesser extent, decommissioning phases. These would be temporary uses and would be largely limited to on-site mixing of concrete, possible fire protection assistance, and dust abatement activities.

During normal operations there may be an increased need for water to suppress dust created by trucking tires to the storage area in the quarry. This additional use could be reduced or eliminated by improving internal haul roads.

Build-up of COPCs in soils may have a long-term, chronic impact on soil-dwelling organisms (e.g. earthworms) and plant life. These might be manifested as a reduction in agricultural productivity or a shift in vegetation from native species to more COPC-tolerant non-native species.

4.10 Cumulative Impacts

Cumulative impacts are the collective impacts on the human environment of the proposed action when considered in conjunction with other past, present, or future actions related to the Proposed Action by location or generic type. Related future actions must be considered when the actions are under concurrent consideration by a state agency.

Air Resources Cumulative Impacts
Potential emissions from the facility under currently permitted operation are referred to as baseline emissions. Modeled impacts using these emission rates are called baseline impacts. Cumulative emissions are the emissions from the cement plant resulting from the addition of tires to the current fuel mix. Modeled impacts from the plant while burning tires are the cumulative impacts.

Compliance with Air Quality Standards
Compliance with ambient air quality standards requires that other sources of air pollutants that could affect the same area be considered. Modeled impacts from the Holcim plant were added to the background pollutant concentration to determine compliance with the MAAQS and NAAQS.

Table 4.10-1 shows reported emissions from point sources within about 50 km (31.06 miles) of Trident for the year 2002. The table does not suggest a correlation between the reported emissions and other COPCs, which vary with the fuel source and process, but it gives an idea of the general point source air emissions in the vicinity.

Table 4.10-1 Industrial Emissions Within 50 km of Holcim (tons per year)

Source Name	CO	NO_x	PM_{10}	Total PM	SO_2	VOC
Holcim Trident (baseline)	46.9	1502.6	228.7	344.0	284.5	1.9
Luzenac America - Three Forks Plant	3.9	9.6	24.9	54.0	0.2	9.0
Kanta Products	0.2	0.4	4.0	8.8	0.0	0.0
Sappington Mill	0.9	3.0	9.4	16.2	0.1	0.1
Exxonmobil Bozeman Marketing Terminal	0.0	0.0	0.0	0.0	0.0	6.7
MSU Central Heating Plant	13.9	28.7	1.3	1.3	0.1	0.9
Bozeman Product Terminal	0.0	0.0	0.0	0.0	0.0	74.4
City of Bozeman Sanitary Landfill	22.9	1.2	3.7	15.3	1.0	1.1
Big Sky Insulation, Inc	0.3	0.3	0.0	0.0	0.0	27.2
Golden Sunlight Mine	107.3	155.5	260.3	546.9	16.8	10.4
Totals	**196.3**	**1701.3**	**532.3**	**986.5**	**302.7**	**131.7**

Source DEQ, 2003a

EPA's facility emissions web site (www.epa.gov/air) was used to identify emissions sources in Gallatin County. Neighboring Madison and Broadwater counties each have one industrial emission source, both of which are located more than 50 km (31.06 miles) from the Holcim site. Emissions from other industrial emissions sources in Gallatin County are quite low and are not expected to impact the same terrain as the Holcim emissions.

The addition of tires to the kiln fuel mix is expected to cause an increase in CO emissions, while emissions of the other criteria pollutants would remain the same or decrease. The addition of tires to the fuel mix is expected to increase the CO emissions by as much as 189 tpy. Modeled ambient CO impacts would change as shown in Table 4.10-2.

Table 4.10-2 Impacts of Tire Burning on Ambient CO Concentrations

Poll.	Avg. Period	Background Conc. ($\mu g/m^3$)	Baseline Impact ($\mu g/m^3$)	Cumulative Impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	MAAQS ($\mu g/m^3$)
CO	8-hour	1,150	1,160	1,177	10,000[a]	10,350[a]
	1-hour	1,725	1,769	1,838	40,000[a]	26,450[a]

[a] Not to be exceeded more than once per year.

Cumulative Impacts for Risk Assessment

Emissions of various HAPs would change as a result of the addition of tires to the fuel mix. Some HAP emissions would increase, while others would decrease. Most of the HAPs emit from the kiln stack, although some HAPs are contained in the CKD. CKD emissions were included in the modeling. CKD baseline and cumulative emissions are compared in Table 4.2-3.

Baseline and cumulative HAP emissions and modeled impacts are listed in Table 4.10-3. The table compares the annual modeled HAP impacts that were used to determine the risk from the project.

Table 4.10-3 Baseline and Cumulative HAP Impacts

Compound	Baseline Kiln Emissions (lb/yr)	Baseline Peak Annual Impacts (µg/m^3)	Cumulative Kiln Emissions (lb/yr)	Cumulative Peak Annual Impacts (µg/m^3)
Acetaldehyde	4,178	1.76×10^{-2}	595	2.51×10^{-3}
Acrolein	98.3	4.15×10^{-4}	98.3	4.15×10^{-4}
Trichloroethene	3.26	1.37×10^{-5}	27.6	1.16×10^{-4}
Antimony	3.00	3.34×10^{-5}	3.05	3.41×10^{-5}
Arsenic	5.07	5.97×10^{-5}	3.39	3.82×10^{-5}
Benzene	9,237	3.90×10^{-2}	7,552	3.19×10^{-2}
Beryllium	1.49	1.68×10^{-5}	1.12	1.26×10^{-5}
Bis (2-ethylhexyl)phthalate	429	1.81×10^{-3}	532	2.25×10^{-3}
Bromomethane	43.2	1.82×10^{-4}	28.7	1.21×10^{-4}
1,3 Butadiene/Butadiene	31.0	1.31×10^{-4}	79.8	3.37×10^{-4}
2-Butanone (MEK)	8.94	3.77×10^{-5}	8.31	3.51×10^{-5}
Butylbenzylphthalate	0.53	2.24×10^{-6}	0.53	2.24×10^{-6}
Cadmium	9.10	1.03×10^{-4}	3.52	3.97×10^{-5}
Carbon Disulfide	1,141	4.82×10^{-3}	161	6.78×10^{-4}
Carbon Tetrachloride	3.35	1.41×10^{-5}	3.35	1.41×10^{-5}
Chlorine	5,272	2.23×10^{-2}	6,355	2.68×10^{-2}
Chlorobenzene	67.9	2.87×10^{-4}	68.8	2.90×10^{-4}
Chloromethane	436	1.84×10^{-3}	181	7.62×10^{-4}
Chromium (total)	13.2	1.49×10^{-4}	10.0	1.13×10^{-4}
Chromium 6	2.42	2.73×10^{-5}	1.29	1.46×10^{-5}
Cobalt	7.42	8.35×10^{-5}	3.96	4.47×10^{-5}
Di-n-Butyphthalate	13.4	5.67×10^{-5}	13.4	5.67×10^{-5}
1,4 Dichlorobenzene	13.4	5.66×10^{-5}	88.3	3.73×10^{-4}
Dichloromethane	394	1.66×10^{-3}	2,716	1.15×10^{-2}
Dimethyl Phthalate	18.6	7.86×10^{-5}	18.6	7.86×10^{-5}
2,4-Dinitrophenol	101	4.27×10^{-4}	101	6.29×10^{-5}
Ethylbenzene	1,945	8.21×10^{-3}	2,991	1.26×10^{-2}
Chloroethane	28.6	1.21×10^{-4}	28.6	1.21×10^{-4}
Formaldehyde	10,846	4.58×10^{-2}	13,643	5.76×10^{-2}
Hydrogen chloride	6,380	2.90×10^{-2}	6,714	3.05×10^{-2}
Hydrogen fluoride	197	$8.96 \mathrm{X} 10^{-4}$	304	1.38×10^{-3}
Lead	127	1.43×10^{-3}	129	1.45×10^{-3}
Manganese	89.4	1.01×10^{-3}	366	4.13×10^{-3}
Mercury	102	4.61×10^{-4}	137	6.23×10^{-4}
4-Methyl phenol	56.6	2.39×10^{-4}	44.2	1.86×10^{-4}
Methylene chloride	366	1.55×10^{-3}	1,769	7.47×10^{-3}
Naphthalene	572	2.42×10^{-3}	461	1.95×10^{-3}
Nickel	15.7	1.77×10^{-4}	19.9	2.24×10^{-4}

Compound	Baseline Kiln Emissions (lb/yr)	Baseline Peak Annual Impacts (µg/m^3)	Cumulative Kiln Emissions (lb/yr)	Cumulative Peak Annual Impacts (µg/m^3)
Nitrobenzene	13.5	$5.71\text{x}10^{-5}$	14.5	$6.13\text{x}10^{-5}$
4-Nitrophenol	287	$1.21\text{x}10^{-3}$	287	$1.21\text{x}10^{-3}$
Phenol	930	$3.93\text{x}10^{-3}$	592	$2.50\text{x}10^{-3}$
Phosphorus	29.4	$3.30\text{x}10^{-4}$	37.3	$4.22\text{x}10^{-4}$
Selenium	75.6	$8.53\text{x}10^{-4}$	47.1	$5.30\text{x}10^{-4}$
Styrene	2,373	$1.00\text{x}10^{-2}$	4,720	$1.99\text{x}10^{-2}$
1,1,1 Trichloroethane	1.61	$6.82\text{x}10^{-6}$	12.8	$5.40\text{x}10^{-5}$
Toluene	11,546	$4.88\text{x}10^{-2}$	17,485	$7.38\text{x}10^{-2}$
Vinyl chloride	93.7	$3.96\text{x}10^{-4}$	167	$7.07\text{x}10^{-4}$
Xylenes, total	8,567	$3.62\text{x}10^{-2}$	13,941	$5.89\text{x}10^{-2}$
Zinc	4,775	$5.39\text{x}10^{-2}$	1,894	$2.13\text{x}10^{-2}$
TCDD Eq. *	$7.66\text{x}10^{-9}$	$2.94\text{x}10^{-9}$	$7.66\text{x}10^{-9}$	$2.94\text{x}10^{-9}$
Total PCBs	3.88	$1.64\text{x}10^{-5}$	3.66	$1.54\text{x}10^{-5}$
PAH- Total	756	$3.19\text{x}10^{-3}$	561	$2.37\text{x}10^{-3}$
PAH-Non-carcinogenic totals	183	$3.19\text{x}10^{-3}$	99	$2.36\text{x}10^{-3}$
PAH-Carcinogenic totals	573	$1.87\text{x}10^{-6}$	462	$5.28\text{x}10^{-6}$

- TCDD Eq. was modeled at the PC-MACT limit to provide a conservative result.

4.10.1 Human Health Effects

The potential for adverse human health effects was expressed in three areas: acute (short-term) noncancer hazard, chronic (long-term) noncancer hazard (and blood lead levels), and cancer risk.

Acute (short-term) Non-cancer Hazard

The quantitative assessment of acute hazards indicated no known risk from acute exposure to ground-level air concentrations at the worst-case location for the 1-hour peak concentration. These results were applicable to both the general population and facility workers. Acute hazard estimates for the baseline and cumulative conditions were indistinguishable.

Chronic (long-term) Non-cancer Hazard

The evaluations of chronic exposure to non-carcinogenic chemicals of potential concern were based on the 1-year annual average worst-case ground-level air concentrations. The estimated chronic non-carcinogenic hazard indices (where greater than 1.0 is considered as not acceptable) were:

Average Exposure: 0.1 (cumulative condition)
High-End Exposure: 0.3 (cumulative condition)

The hazard indices for both the average and high-end exposures were below 1.0, indicating no expected hazard from chronic exposure (assuming a 30-year exposure). The assessment

considered a multi-pathway exposure to a future potential resident located at the facility boundary.

Blood-Lead Levels

The predicted blood-lead levels in children due to exposures to lead (where greater than 10 micrograms of lead per deciliter of blood, > 10 µg/dL, is not acceptable) estimated using EPA's IEUBK model, were:

> Geometric Mean Blood Lead Level: 1.2 µg/dL (cumulative condition)
> Percent Exceeding 10 µg/dL: 0% (cumulative condition)

As evident above, the average blood lead level in children (the most sensitive receptors) would be less than the 10 microgram per deciliter acceptable limit. EPA (1994b) recommends that lead concentrations in residential soil not exceed a level such that a typical child would have greater than 5 percent chance of exceeding 10 µg/dl. Therefore, no mitigation measures would be necessary for lead exposure.

Cancer Risk

Risks to members of the general public were evaluated for the following conditions:

- Risks at the Worst-case Location – evaluated risk for the most exposed receptor, an individual (although hypothetical since there are no residents living at this location) living a subsistence type of lifestyle at the location of the worst-case ground-level air concentration.

- Risks in Nearby Communities – evaluated risks to individuals living in certain established communities (Three Forks School, Belgrade Airport, and Manhattan) around the facility

- Risks from Locally Caught Fish and Game – evaluated risk to individuals who hunt and fish in the area surrounding the facility.

The evaluations of chronic exposure to carcinogenic COPCs were based on the 1-year annual average ground-level air concentrations at different locations as appropriate for each type of exposure. Residential exposures are assumed to be 30 years at the same residence. Risks are expressed as estimated incremental risk of cancer above the background rate of cancer. A majority of the people in the area are predicted to experience risks that are at or below the range that is generally considered acceptable (1 in 10,000 to 1 in 1,000,000). These risks are the incrementally increased risk of cancer as a result of lifetime exposure to COPCs from the site. The background rate of cancer from all sources (natural and anthropogenic) is one in three. Certain types of land use and lifestyles close to the facility will result in larger incrementally increased cancer risk than would be experienced by the general population; for example, subsistence living or concentrated agricultural operations, such as feed lots, greenhouses, fish farms, or organic farms.

Table 4.10-4 Cancer Risks for the Aggregate of all Pollutants for Various Scenarios

Scenario	Baseline or Cumulative Condition	Average Exposure	High-End Exposure
Worst-Case Location	Baseline	2×10^{-6}	1×10^{-5}
Worst-Case Location	Cumulative	2×10^{-6}	1×10^{-5}
Worst-Case Location – non food ingestion pathways	Cumulative	7×10^{-7}	3×10^{-6}
Three Forks School – non food ingestion pathways	Cumulative	2×10^{-8}	5×10^{-8}
Three Forks School – Most likely conditions (includes food ingestion pathways)	Cumulative	7×10^{-8}	5×10^{-7}
Manhattan – non food ingestion pathways	Cumulative	4×10^{-9}	1×10^{-8}
Belgrade Airport – non food ingestion pathways	Cumulative	2×10^{-9}	9×10^{-9}
Risk from ingestion of river fish	Cumulative	1×10^{-9}	1×10^{-9}
Risk from lake/pond fish	Cumulative	5×10^{-7}	6×10^{-6}
Risk from locally hunted game (15% of meat from the area)	Cumulative	5×10^{-9}	4×10^{-8}
Risk from locally hunted game (100% of meat from the area)	Cumulative	4×10^{-8}	3×10^{-7}

Table 4.10-4 presents cancer risks for the aggregate of all pollutants for various scenarios for both the baseline condition and the cumulative condition. The scenarios vary by location of population (e.g., facility property boundary [worst-case location], Three Forks School, Manhattan, or Belgrade Airport) and estimated exposure (average or high-end). The total risk at the worst-case location at the high-end exposure is 1×10^{-5} (1 in 100,000) for both the baseline condition and cumulative conditions.

In the analysis of individual pollutants at the worst-case location, the risk from dioxin for the baseline condition and cumulative condition at the average exposure is 1×10^{-6} (1 in 1 million). For the worst-case location, for both the baseline and cumulative conditions at the high-end exposure, the risk from dioxin is 8×10^{-6} (8 in 1 million). The risk from locally caught fish from lakes/ponds for the high-end fish consumption rate is 3×10^{-6} from dioxin and 3×10^{-7} from PCB exposure. The risk from consuming locally hunted game, if 100 percent of the meat consumed is from the area, at the high-end exposure, is 2×10^{-6}, with most of the risk due to dioxin.

Land Use

NorthWestern Energy is building a 161-kV transmission line from the Three Rivers Substation north of Three Forks to the Jackrabbit Substation west of Bozeman and south of Belgrade. The Three Rivers to Jackrabbit 161 kV Transmission Line Project is approximately 29 miles long. Additional industrial projects were not identified in the vicinity of the plant site.

Transportation and Public Services

The Proposed Action would increase traffic and vehicle-related air emissions in the plant area. Traffic could also increase in the area as a result of transporting livestock to a proposed

concentrated animal feeding operation. This operation would be located approximately four miles northwest of Three Forks in Broadwater County (NE ¼ Section 16, T2N, R1E). According to an Environmental Assessment prepared by DEQ for the project, "the potential for increased truck/pickup-trailer traffic will add to vehicles on the surrounding roads. Sale day will increase traffic by approximately 30 to 50 pickup-trailers and 10 tractor/trailers once a week."

Because the Missouri Headwaters State Park is located near the plant site, seasonal traffic volume variations would be expected in the area due to park visitors. Visitation to the park has also increased in the last few years and is expected to further increase as a result of the Lewis and Clark Expedition Bicentennial. Cumulative impacts in the area would occur as a result of increased traffic associated with the Proposed Action in conjunction with increases in traffic associated with the Lewis and Clark Expedition Bicentennial. Traffic speed along Montana Route S-286 through the park is currently a safety concern with the Montana Fish, Wildlife & Parks, which has recommended a reduction of the posted speed limit through the park to 45 miles per hour (Heagney, 2005).

Water, Soils, and Wildlife

Prior to the mid-1970s, the drainage and destruction of wetlands were accepted practices in the United States and were even encouraged by specific government policies. Wetlands were replaced by agricultural fields and by commercial and residential development (Mitsch and Gosselink, 1993).

Past and present activities include Holcim and its predecessors operating a portland cement plant at the current location for nearly 100 years. In addition, a century or more of agricultural and mining activities have affected water quality and water use in the area (see Section 3.4), as well as soils (see Section 3.3). Wetlands, for example, were often drained or filled to reclaim them for other uses.
Toxicity reference values (TRVs) used in the ERA are threshold values. That means that, when concentrations were below that value, there were no observable effects to laboratory test plants and animals, but, once concentrations exceeded the TRV, effects were observed. Those effects could be behavioral, damage to one or more organs, cancer, or death (Portage Environmental, 2004).
The ERA found that COPC concentrations in soils and water, following 100 years accumulation from Holcim's emissions, would exceed, or be within an order of magnitude, of TRVs for several representative species or food guilds. Thus, continued emissions of these COPCs would increase impact levels associated with Holcim emissions. Examples of documented degradation to the environment in the vicinity include Fish Consumption Advisories due to mercury in Willow Creek and Canyon Ferry Reservoirs, as well as the use impairments on all of the major streams in the area as shown by 303(d) assessments (see Section 3.4.2.2).

Reasonably foreseeable future activities in the area center around continued population growth, following the trends discussed in Sections 4.6 and 4.7. Increased sources of traffic described under Land Use and Transportation, can become sources of sediment to nearby surface water bodies, including the Missouri River. This increased sediment can be the result of dust or storm water runoff from off-road disturbance (including unpaved road shoulders). Increased traffic along haul roads inside the facility property associated with tire delivery would also contribute to

this potential source of sediment. Storage of tires in trailers on the quarry floor may present a potential risk of leaching chemicals into groundwater in the event of a fire.

The TMDL process is in progress for the Missouri River from Toston to Canyon Ferry and for the Gallatin, Madison and Jefferson rivers from their mouths (Missouri River) upstream for various distances. The Missouri River from its headwaters to Toston has not yet been assessed for 303(d) status. While the TMDL process does not represent an additional use, it signals a new level of scrutiny that may affect all water users in the region.

The project would not destroy or degrade any wildlife habitat, nor directly result in any mortality of individual animals. Indirectly, increased traffic would pose a danger for wildlife crossing highways. This includes both game and non-game species. While this is not likely to have a substantial effect on local populations, it would likely affect individual animals. There are no other existing facilities or anticipated projects in the vicinity that would contribute to potential effects associated with COPC deposition.

Property Impacts

Table 4.10-5 shows before and after appreciation rates based on the 2001 date of the Holcim fuel change announcement. The average price of homes sold in Three Forks declined between 2001 and 2002 before recovering. The announcement of the fuel change at the cement plant coincides with this drop. However, the upward appreciation trend seems to have resumed even with substantially more publicity and public review of this proposal.

The housing stock in Three Forks is markedly older and of lower quality than in Bozeman, a relatively affluent university town and county seat. Lower quality or older homes do not appreciate as rapidly as newer dwellings. Notwithstanding the Trident plant, Three Forks is a more remote community with a limited employment base compared with Bozeman and Belgrade. Holcim and the Luzenac talc mill are the two major private employers for Three Forks.

The average price of homes sold can be a fairly consistent indicator of the impacts on residential property values over time. In this case, quarterly reports were annualized because the number of sales during the winter was found to be fairly low. The average price can be distorted to the extent that in one year high priced homes sell, and the next year, only low priced homes. This may or may not have been the case in 2002.

This analysis suggests that residential property values have shown robust appreciation throughout Gallatin County and that Three Forks has tracked with that performance. Comparing appreciation before and after 2001 suggests values have risen at an even steeper rate after the announcement of the fuel change plans by Holcim.

Table 4.10-5 shows annual appreciation rates for home sales based on the average price of homes sold, before and after the Holcim announcement of a fuel change at the cement plant. It is important to note that Three Forks is a small market with 20-30 home sales per year, compared with 400-500 home sales county wide, but the bifurcated analysis is telling. Three Forks reports a faster rate of appreciation than Gallatin County as a whole for the same two year period.

Table 4.10-5 Before and After Annual Appreciation-Average Price of Homes Sold

	Three Forks	Appreciation %	Gallatin County	Appreciation %
1996	$82,223		$127,972	
1997	$83,762		$125,837	
1998	$90,550		$135,780	
1999	$90,098		$135,403	
2000	$91,600		$161,609	
Before Holcim fuel change announcement		4.07%		6.64%
2001	$102,300		$178,980	
2002	$99,189		$183,482	
2003	$114,581		$193,308	
After Holcim fuel change announcement		6.00%		4.00%

Source Property Value Impact Assessment, 2004

4.11 Mitigation Measures

Conditions or limitations may be required in a permit or license without the proponent's consent if they are necessary to ensure compliance with permitting or licensing requirements. Under Montana law, mitigation measures that reduce or eliminate impacts, but are not necessary to ensure compliance with permitting or licensing requirements, are voluntary and can be permit or license conditions only if the project proponent requests that they be incorporated into the permit or license.

Air Quality

An increase in CO emissions is expected from the use of tires as fuel. The CO and HAPs BACT analyses evaluated additional controls, and DEQ determined that proper design and combustion practices would constitute BACT. DEQ has included permit conditions in the draft air quality permit (Appendix C) to ensure the facility will operate in compliance with all applicable rules and regulations and to reduce any air quality impacts.

Human Health and Ecological Risk

As presented in Section 4.3, there would be no conditions under which the aggregate risk from all pollutants would exceed a total risk level of 1×10^{-5}; therefore, the change in risk resulting from the proposed action can not exceed 1×10^{-5} as defined by Montana's negligible risk rule. No mitigation measures are needed in this case.

However, there may be some conditions under which the negligible risk level of 1×10^{-6} would be exceeded for individual pollutants. These conditions / responsible pollutants are summarized in the following table:

Table 4.11-1 Conditions / Responsible Pollutants

Condition	Pollutant	Risk	Risk Due To:
1.Worst-case location – high end exposure	Dioxin	8×10^{-6}	1. Ingestion of mother's milk 2. Beef ingestion 3. Other food ingestion pathways
2.Risk from consumption of lake/pond fish in Three Forks area	Dioxin PCBs	3×10^{-6} 2×10^{-6}	1. Consumption of lake/pond fish

The draft permit contains limits on emissions, including dioxin, and a limit of up to 12,000 tons of slag from the ASARCO smelter during any rolling 12-month time period, to ensure that the negligible risk level is not exceeded.

Land Use

Holcim would be subject to conditions required by the air quality permit and the solid waste management system license. These requirements include a fire control plan. This plan must be approved by the local fire chief and DEQ before a solid waste management system license can be issued. Conditions that would be required of Holcim concerning tire fires include, but are not limited to, the use of appropriate on-site fire fighting equipment, training, berms, and fire lanes. On-site fire training would be required for Holcim employees as well as Three Forks Fire Department volunteers prior to tire delivery. This training would address tire storage, hazardous materials precautions, safety, and fire suppression. Berms would have to be high enough to contain the potential volume of liquid that would be produced from a tire fire that burned the maximum number of tires at the site at any given time. Fifty-foot-wide fire lanes would be required between each row of tire storage trailers, and the fire lanes and the general area in the vicinity of the tire storage trailers would need to be kept free of vegetation.

Water

Holcim will continue to monitor groundwater on a twice-yearly basis. Monitoring at wells MW1A, MW2, MW3, and MW4 should be expanded to include organic compounds so that contaminants potentially migrating from the tire storage area into the shallow aquifer would be detected. Two additional wells should be added, one up gradient of the tire storage area and the other immediately down gradient, and monitored twice annually for both inorganic and organic constituents.

Because modeling of potential impacts of facility emissions on lakes and reservoirs was inconclusive due to the variables introduced by hydrologic conditions, a baseline monitoring program of lakes, ponds, reservoirs, and wetlands within 10 km (6.21 miles) of Trident would determine whether emissions from the facility are causing environmental damage. Such a program would include water, sediment, and fish tissue samples.

Soil

Soil sampling at undisturbed sites within 10 km (6.21 miles) of the facility (number and locations to be determined by DEQ) would be used to check the accuracy of modeling results for

cadmium, chromium, manganese, mercury, selenium, lead, zinc, naphthalene, and dioxins (TCDDs).

Tissue samples would be taken from soil invertebrates (e.g., earthworms) to check the accuracy of modeling results.

Wildlife

Tissue samples would be taken from road-killed or hunter killed deer or other species within 10 km (6.21 miles) of the facility to check the accuracy of modeling results.

Socioeconomics

Scrap tire disposal or resource recovery facilities licensed after July 1, 1987, must have financial assurance for closure.

CHAPTER 5
CONSULTATION AND COORDINATION

5.1 PUBLIC SCOPING

On December 17, 2003, DEQ issued a press release announcing its intent to prepare a DEIS to evaluate the tire burning proposal. The press release started the public scoping process and invited public comments on the issues that should be addressed in the DEIS. DEQ conducted a public scoping meeting January 20, 2004, at the Manhattan Elementary School. Written comments were accepted until January 23, 2004.

More than 180 letters, e-mails, and comment forms were received between December 2001 and January 2004. These documents and the oral testimony during the scoping meeting contained over 2,000 individual comments. Similar comments were consolidated. Issues raised during the period are listed in Section 1.9.

5.2 Agency Consultation & Coordination

To begin the agency scoping process, federal, state, and local agencies with an interest in the Project or the Project study area were contacted and asked to provide comments about the Project, identify issues that would need to be addressed, and supply data, information, and/or mapping.

The following agencies will be sent the DEIS in electronic or hardcopy format:

- Waste and Underground Tank Management Bureau
- Air Resources Management Bureau
- Montana Fish, Wildlife & Parks
- Montana State Historic Preservation Office
- USDI Fish and Wildlife Service

5.3 Public Consultation and Coordination

Holcim submitted its initial application on October 3, 2001. DEQ held a public information meeting at Manhattan High School on December 18, 2001.

DEQ issued a Draft EA and Preliminary Determination for modification of Holcim's air quality permit on March 24, 2003. The public comment period lasted until May 9, 2003, and then was extended to May 30, 2003, at the request of the Gallatin County Health Department. DEQ held a public meeting at the Manhattan Elementary School on April 29, 2003.

On August 15, 2003, DEQ issued a Final EA, which concluded that an EIS should be prepared. The public scoping period for the EIS extended from December 17, 2003, to January 23, 2004. DEQ held a public scoping meeting on January 20, 2004, at the Manhattan Elementary School.

Both oral and written comments were submitted at the two public meetings. Interested persons, groups, and local and state government agencies also submitted comment letters and e-mail messages.

CHAPTER 6
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CHAPTER 8
List of Acronyms AND Glossary

8.1 ACRONYMS

ADT	Annual Average Daily Traffic
AERMOD	AMS/EPA Regulatory Model
AQRV	air quality related value
ARM	Administrative Rules of Montana
ASOS	Automated Surface Observing System
ATTRA	Appropriate Technology Transfer for Rural Areas
AWMA	Air and Waste Management Association
BACT	Best Available Control Technology
BLM	Bureau of Land Management
Btu	British thermal unit
CAA	Clean Air Act
CAAA	Clean Air Act Amendments 1990
CAPCOA	California Air Pollution Control Officers Association
CARB	California Air Resources Board
CEMS	Continuous Emission Monitoring System
CFR	Code of Federal Regulations
CKD	cement kiln dust
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COPC	chemical of potential concern
COMS	Continuous Opacity Monitoring System
CRP	Conservation Reserve Program
DCS	Distributive Control System
DEIS	Draft Environmental Impact Statement
DEQ	Montana Department of Environmental Quality
DES	Montana Department of Disaster and Emergency Services
DL	Detection Limit
DNRC	Montana Department of Natural Resources and Conservation
EA	Environmental Assessment
ECHO	Enforcement & Compliance Online
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERA	Ecological Risk Assessment
ESA	Endangered Species Act
ESP	Electrostatic precipitator
ESV	Ecological screening value
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FF	Fabric Filter
FPRP	Fire Prevention and response plan

GIS Geographic Information System
GMO Genetically Modified Organisms
GWIC Ground Water Information Center
HAP Hazardous air pollutant
HI hazard index
HPV high priority violator
HQ hazard quotient
HUC hydrologic unit code
ID Induced draft
IEUBK Integrated Exposure Uptake Biokinetic Model for Lead in Children
Km kilometer Equivalent to 0.621 miles
LULU locally undesirable land use
MAAQS Montana Ambient Air Quality Standards
MACT Maximum Achievable Control Technology
MBEWG Montana Bald Eagle Working Group
MBMG Montana Bureau of Mines and Geology
MCA Montana Code Annotated
MDT Montana Department of Transportation
MFWP Montana Department of Fish, Wildlife and Parks
MEPA Montana Environmental Policy Act
MFISH Montana Fisheries Information System
MNHP Montana Natural Heritage Program
MPDES Montana Pollutant Discharge Elimination System
MSL mean sea level
MRL Montana Rail Link
MSW Municipal Solid Waste
MT-GAP Montana Gap Analysis Program
NAAQS National Ambient Air Quality Standards
NCDC National Climatic Data Center
NESHAP National Emission Standard for Hazardous Air Pollutants
NHPA National Historic Preservation Act
NFPA National Fire Protection Agency
NOAA National Oceanic and Atmospheric Administration
NOP National Organic Program
NO_2 Nitrogen Dioxide
NO_X Nitrogen Oxide
NRCS Natural Resources Conservation Service
NRIS Montana Natural Resource Information System
NSPS New Source Performance Standards
NWI National Wetland Inventory
NWS National Weather Service
OAQPS Office of Air Quality Planning and Standards
OSHA Occupational Safety and Health Administration
PAH polycyclic aromatic hydrocarbon
PCA Portland Cement Association

PC MACT maximum achievable control technology for portland cement plants
PM_{10} Particulate matter smaller than 10 microns in diameter
PPM Parts Per Million
PRG preliminary remediation goal
PSD Prevention of Significant Deterioration (of air quality)
RCO Regenerative catalytic oxidizer
RDF Refuse Derived Fuel
RTO Regenerative thermal oxidizer
RfD reference dose
SCR Selective Catalytic Reduction
SHPO state historic preservation office
SIP State Implementation Plan
SLERA Screening Level Ecological Risk Assessment
SNCR Selective Noncatalytic Reduction
SO_2 Sulfur dioxide
SSM Startup, Shutdown and Malfunction
SSURGO Soil Survey Geographic
STATSGO State Soil Geographic
SWPPP Storm Water Pollution Prevention Plan
TCDD eq Tetrachlorodibenzo-p-dioxin equivalent
TCEQ Texas Commission on Environmental Quality
TDF tire-derived fuel
TES threatened, endangered or sensitive species
TM Thematic Mapper
TMDL total maximum daily load
TRI Toxics Release Inventory
TRV toxic reference value
TSP Total suspended particulates
USEPA United States Environmental Protection Agency
USGS United States Geological Survey
UTM Universal Transverse Mercator
USDI US Department of Interior
USFS US Forest Service
USFWS US Fish and Wildlife Service

VOC Volatile Organic Compound
WSA Wilderness Study Area
WRCC Western Regional Climate Center
X/Q dispersion coefficient

8.2 Glossary

Air Pollution –particulate matter, vapor, gas, odorous substances or any combination of these
Alluvial – Composed of alluvium or deposited by a stream or running water
Alluvium – A general term for all deposits resulting from the operations of modern rivers and creeks, including the sediments laid down in riverbeds, floodplains, and fans at the foot of mountain slopes
Ambient Air Quality Standard – An established concentration, exposure time, and frequency of occurrence of air contaminant (s) in the ambient air that shall not be exceeded
Ambient Level – The existing level of air pollutants, noise, or other environmental factors used to describe background conditions (i.e., conditions before a project is implemented)
Apiary – A place where bees are kept
Aquifer – Rock or sediment in a formation, or group of formations, or part of that formation that is saturated and sufficiently permeable to transmit water to wells and springs
Baghouse - Also referred to as a fabric filter, bag houses separate particulates from a flue gas stream by filtration of the gas through a woven or felted fabric that has been sewn into a bag
Best Available Control Technology (BACT) – An EPA requirement that all major new plants use to limit their emissions to prevent significant deterioration (PSD) of air quality in areas that were already in attainment of the National Ambient Air Quality Standards
Best Management Practices (BMP) – A practice or combination of practices that are determined to be the most effective and practicable (including technological, economic, and institutional considerations) means of controlling point and nonpoint pollutants at levels compatible with environmental quality goals
Big Game – Those species of large mammals normally managed as a sport hunting resource
Bituminous – Type of coal with carbon content from 45% to 86% and heat value of 10, 500 to 15,500 Btus-per-pound; most plentiful form of coal in US; used primarily to generate electricity and make coke for steel
Btu – A measure of the energy required to raise the temperature of one pound of water by one degree Fahrenheit

Carbon Monoxide – a colorless odorless toxic gas formed when carbon-containing compounds or fuels are burned with insufficient air

Carcinogen - a substance or agent that can cause cancer. Radiation and some chemicals and viruses are carcinogens
Clinker – nodules composed of tricalcium silicate, dicalcium silicate, tricalcium aluminate, and tetracalcium aluminoferrite that form in the sintering zone of the cement kiln.
Conservation Reserve Program – A voluntary federal program that offers annual rental payments, incentive payments for certain activities, and cost-share assistance to establish approved cover on eligible cropland to improve soil, water, and wildlife resources
Conveyor – A continuous moving belt that transports large volumes of material
Cultural Resources – Sites, buildings, structures, districts, landscapes, or objects that are important to a culture or community for scientific, traditional, religious, or other reasons. Cultural resources can be divided into three major categories: archaeological resources, architectural resources, and Traditional Cultural Properties

Dioxin – Any derivative of dibenzo-p-dioxin, produced as a toxic byproduct of combustion processes, the manufacture of some herbicides and bactericides, and in chlorine bleaching of paper

Dispersion coefficient - A mathematical algorithm used to estimate (model) the dispersion of pollutants in the atmosphere due to transport by the mean (average) wind and small scale turbulence expressed in units of micrograms/cubic meter per grams/second [ug/m^3)/g/sec)], generated by the AERMOD model runs for each receptor point

Electrostatic Precipitator (ESP) – An electrical device for removing small particles utilizing an electric charge to collect particles on a plate prior to release of gas from a stack.

Emission – The release of air contaminants into the ambient air

Ephemeral Drainage – A stream or stream segment that flows only briefly in response to local precipitation and has no base flow

Fossil Fuels – Naturally occurring fuels of an organic nature, such as coal, crude oil, and natural gas

Fugitive Dust – A particulate emission made airborne by forces of wind or human activity. Unpaved roads, construction sites, and tilled land are examples of areas that generate fugitive dust

Furan – a colorless flammable liquid used as a solvent and in the manufacture of polymers. A common name for polychlorinated dibenzofurans.

Greenhouse gases – gases capable of absorbing heat in the atmosphere (e.g. carbon dioxide, methane, ozone, nitrous oxide)

Groundwater – Water found beneath the Earth's surface where all empty space in the rock is completely filled with water

Hedonic model – A multiple regression analysis tool that helps explain what characteristics account for variances in sale price

Intermittent Stream – A stream that flows in a well-defined channel in response to precipitation and is dry for part of the year

Isopleth – A uniform display of spatial patterns of selected concentrations

Kiln – the manufacturing unit in which clinker is formed

National Register of Historic Places (NRHP) – The Nation's official list of cultural resources worthy of preservation authorized under the National Historic Preservation Act of 1966.

Nitrogen Dioxide (NO_2) – A reddish brown gas that is a component of smog

Nitrogen Oxides (NO_X) – A group of compounds containing varying proportions of nitrogen and oxygen

Noxious Weeds – Exotic (non-native) species of plants that proliferate and reduce the value of land for agriculture, forestry, livestock, wildlife, or other beneficial uses

Percentile - a value on a scale of one hundred that indicates whether a distribution is above or below it

PM_{10} – abbreviation for particulate matter with an aerodynamic diameter less than 10 micrometers (10 mm) across. Clusters of small particles, such as carbon particles, in the air that come mostly from vehicle exhausts

Process dry – a cement manufacturing process in which the feed material enters the kiln system in dry powdered form

Process wet - a cement manufacturing process in which water, typically 30% to 40% is added to the feed material and then fed to the kiln

Section 106 – A section of the National Historic Preservation Act of 1966 describing procedures for identifying, evaluating, and protecting cultural resources The implementing regulations for Section 106 are in 36 CFR part 800

Selective catalytic reduction (SCR) - A post-combustion NOx reduction process which removes NOx from flue gases by reaction with ammonia in the presence of a catalyst
Selective non-catalytic reduction (SNCR) – A post-combustion NOx reduction process wherein ammonia or other compounds such as urea are injected downstream of the combustion zone in a temperature region of 1400F to 2000F. If injected at the optimum temperature, NOx is removed from the flue gas through reaction with the ammonia
Special Status Species – Those species of plants or animals that have a protective status designated by a state or federal agency because of general or localized rarity or population decline
State Historic Preservation Officer (SHPO) – The state official charged with overseeing the implementation of the Section 106 process
Stochastic - A statistical evaluation of a range (i.e. indexed collection of random variables) of exposure parameters involving or showing random behavior
Sulfur Dioxide - a colorless pungent toxic gas used in making sulfuric acid and as a preservative, fumigant, and bleaching agent
Volatile Organic Compound (VOC) – Any of several compounds of carbon that participate in atmospheric photochemical reactions, forming secondary pollutants
Wetlands – Areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances, does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction